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SUMMARY OF RECENT ABSTRACTS *

VI. PLAGUE †

Epidemiology

Macchiavello (p. 584) discusses the classification of plague according to its epidemiological and ecological features, to which are added the names of the rodents concerned. 8 categories are mentioned—*Pestis nautica, urbana, urbanoruralis, ruralis domestica, murina campestris progressiva, campestris regressiva, silvestris* and *silvatica.*

Plague appeared in Egypt in 1899 after an absence of more than 50 years, and it attacked the great ports and spread by water-borne traffic along rivers and canals or the coast until the whole country was affected. Hussein (p. 181) shows that the incidence diminished from 1931, exhibiting the spontaneous disappearance which has been a feature elsewhere, but there were outbreaks in 1943–47 occasioned by the heavy war-time traffic in the ports. DDT was first used in 1946 and the country soon became completely free from the disease.

Link (p. 1337) has written a monograph on the history of plague in the United States since 1899, where it broke out in San Francisco. Accounts are given of the major outbreaks, of the control measures adopted, and of plague in wild animals. The monograph should be read in full.

Reservoir Hosts—Transmission

Referring to the controversy about the rodent hosts of plague in Palestine in Biblical times Quan and Kartman (p. 746) point out that differences in susceptibility to *Pasteurella pestis* can be found between

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1956, v. 53. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on plague in this series see the July issues of the *Tropical Diseases Bulletin* each year since 1939.

wild and laboratory-bred rodents of the same species. They think that resistant rodents may be of paramount importance in the maintenance of permanent foci of enzootic plague, for instance in California.

Loosjes (p. 1235) discusses the disappearance of plague from Western Europe, pointing out that in the 19th century the environment became unsuitable for the black rat because of changes in building methods and materials. In the last few decades, however, the black rat has been spreading again, partly through immigration but also by multiplication, and building methods are changing in a way favourable to the black rat. It is therefore important that a careful study should be made of the present increase in these rats, and that if possible it should be ended.

In part of Madagascar plague is probably associated with ricefields, where temporary shelters used by work people and children are attractive to rats and provide good opportunities for spread to man. Brygoo and Creff (p. 1336) state that the use of DDT and the EV vaccine are the chief measures of control.

Studies in Hawaii indicate that rats in the enzootic plague area do not migrate widely, but constitute more or less sedentary populations which Kartman and Lonergan (p. 586) consider to be suitable for the perpetuation of wild-rodent plague.

In a fresh investigation of the classical studies on the blocking of the proventriculus of infected fleas by the clotting of the infected blood and subsequent regurgitation of fragments of the clot during renewed attempts to feed, Cavanaugh *et al.* (p. 990) failed to induce blockage in *Monopsylla anisus* fed on mice infected with an avirulent strain, or to transmit the infection by bite. The same authors (p. 991) succeeded in infecting *Xenopsylla cheopis* by allowing them to feed on infected blood through a membrane, and in demonstrating blockage. The proventricular masses were broken up during subsequent attempts to feed, but attempts to transmit this infection by bite all failed.

Holdenried and Morlan (p. 586) isolated *P. pestis* from 6 species of fleas and 6 of rodents in localities near Santa Fe, New Mexico, where there is a small epizootic area.

Aetiology

Girard (p. 746) has found that peptone broth used in nutrient agar contains substances which inhibit the growth of small inocula of *P. pestis*, and that this inhibition can be prevented by adding blood or serum to the medium, or by eliminating the beef broth and using a plain water solution of certain brands of peptone. This inhibition is not seen with *P. pseudotuberculosis*.

It has generally been believed that *P. pseudotuberculosis* produces acid from rhamnose and that *P. pestis* does not, and that this is a distinguishing factor between them. Brygoo and Courdurier (p. 585) have examined a large number of laboratory strains of *P. pestis* in Madagascar (where *P. pseudotuberculosis* does not occur in guineapigs) and they

found that many strains fermented rhamnose, especially when the media were particularly favourable to growth. The property of fermenting rhamnose is not confined to the glycerol-negative strains, and does not require the presence of bacteriophage. Similarly, Girard and Chevalier (p. 1423) examined 77 strains of *P. pestis* and found that 22 fermented rhamnose after varying periods of incubation. They think that rhamnose-fermenting mutants can be detected in all strains. Fermentation of rhamnose by mutants seldom appears before 6 days, is irregular and incomplete, and does not affect the practical value of the rhamnose test for differentiation of *P. pestis* and *P. pseudotuberculosis*.

The optimum temperature for the growth of *P. pestis* in culture is 26°C. Goodner (p. 880) shows that growth of an avirulent strain at 42°C., though not so profuse as at 26°C., produces organisms of greatly enhanced toxicity. Similarly, adverse culture media or adverse gaseous environment result in relatively poor growth with enhanced toxicity, and the author suggests that this phenomenon may explain the profound illness of patients with pneumonic plague without evidence of overwhelming bacterial multiplication. In these cases the high temperature may have increased toxicity. Since toxicity varies with external factors, it does not appear to be related to virulence. Ajl *et al.* (p. 311) describe a technique for the isolation and purification of the endotoxin of *P. pestis*. Isolation involved extraction with acetone, and purification involved extraction with sodium chloride solution and precipitation by various means, but the final purification was by continuous paper electrophoresis, which had at the time not been applied to the purification of bacterial toxins. The final product was completely free from nucleoproteins, carbohydrate and capsular material; it was antigenic, producing a specific antitoxin when injected into rabbits. They (p. 312) show that this antitoxic serum did not react with envelope antigen, but neutralized toxin extracted from several strains of *P. pestis* (indicating that all toxins have similar antigenic structure). It remains to be seen whether antitoxic immunity alone will modify the disease in experimental animals, now that antiserum to the purified toxin can (for the first time) be prepared. The purified toxin was found to be specially useful in the haemagglutination test and in this way it can be used for quantitative estimation of plague antitoxin in immune sera in general.

Burrows and Bacon (p. 1424) show that resistance of *P. pestis* to phagocytosis disappeared rapidly from organisms kept in the refrigerator, and that low concentrations of streptomycin suppressed the development of resistance. Virulent organisms grown in a medium containing mouse peritoneal fluid or whole blood produced a factor inhibiting phagocytic activity. Burrows (p. 881) presents evidence which suggests that a major determinant of virulence in *P. pestis* is the antigen which confers on the organisms the property of resistance to phagocytosis, which is probably the long-sought Vi antigen. He shows that virulent strains grown at 28°C. are sensitive to phagocytosis, but when grown at 37°C. in

tryptic-digest meat broth at *p*H 7·0 they become resistant to phagocytosis, and that antisera prepared against these resistant strains render them sensitive to phagocytosis. These phenomena are not seen with avirulent strains. Fraction I does not seem to be responsible for virulence.

Parry (p. 1423) has demonstrated an interference phenomenon with *P. pestis* strain L37; injection of 10^4 organisms intraperitoneally in white rats readily killed them, but at doses of 10^6 death was delayed, though 10^7 readily killed them. Interference was produced also by the addition of killed organisms, a cell-free vaccine or a live vaccine, to small lethal doses of L37. Non-specific interference was produced by intravenous Indian ink before the challenge dose.

Crumpton and Davies (p. 989) have used the agar diffusion precipitin technique of Ouchterlony for the antigenic analysis of *P. pestis*, and have found that in addition to envelope antigens, toxin and specific polysaccharide, there are varying numbers of other distinct antigens (up to 7) in the different strains. This technique has also been supplemented by electrophoretic analysis of the antigens. Some avirulent strains lack certain of these antigens. The paper should be read in full. Bhagavan *et al.* (p. 1114) also show that *P. pestis*, virulent or avirulent, contains 7 antigens demonstrated by the Oudin technique—4 thermolabile, 2 thermostable and 1 which is haptenized Fraction I. 5 are common to *P. pseudotuberculosis*. Ransom *et al.* (p. 313) show that when *P. pestis* is suspended in normal rabbit serum or albumin from such serum, for the gel-precipitin test, there is retardation of diffusion of antigenic components, which indicates that there may be a combining affinity between the albumin and the *P. pestis* antigens. This may explain aberrant results in the Oudin test.

Thal (p. 1339) argues that as one antigen (R) of *P. pseudotuberculosis* is also present in *P. pestis*, immunization by the former against plague might be possible, and he found that cross-protection did occur. This may be related to the antibody produced against the water-soluble protein fraction IB of *P. pestis*, which reacts with extracts of *P. pseudotuberculosis* and can be removed by absorption with either organism.

The antigen of *P. pestis* concerned in sensitizing erythrocytes so as to make them agglutinable by serum containing antibodies to *P. pestis* was found by Fukumi *et al.* (p. 182) to be a polysaccharide.

Davies (p. 988) has extracted a specific lipopolysaccharide from *P. pestis*. It is a hapten, and it can be extracted from rough and smooth strains. It is non-protective, relatively non-toxic, but strongly pyrogenic.

Tests: Clinical Findings: Control

Baltazard *et al.* (p. 1338), for WHO, have issued a long paper on recommended laboratory methods for the diagnosis of plague. There are sections on general methods, including cultivation, biochemical and serological tests and animal experiments; on diagnosis of rodent plague and plague in insects and in patients; on examination of suspect dead bodies;

and on precautions. The detailed instructions must obviously be sought in the original.

The haemagglutination test was used by PAYNE *et al.* (p. 1422) for examining sera from persons with varying types of experience of plague antigens in Madagascar. Sera of persons who had recovered from plague usually contained capsular antibodies for months or years, but rarely antitoxin, though antitoxin was present in persons who had received the EV vaccine. Capsular antibodies were found in some persons with no history of vaccination or of plague, which indicates that unrecognized or clinically inapparent infections may occur. No clear-cut relationship between circulating antibody and skin reactivity to capsular protein and toxin could be established.

In a paper on the general subject of the nature of certain infectious diseases WOODWARD (p. 1325) quotes a case of pneumonic plague in which, though organisms had been demonstrated on the second day of illness, they could not be recovered by suitable bacteriological means at necropsy.

In a study of experimental plague in monkeys, which was almost always fatal, HOESSLY *et al.* (p. 314) found that the most striking feature was the pronounced circulatory failure. They suggest that a similar condition in human cases is more common than is generally believed, and that the probable cause is the direct action of the toxic elements on the peripheral blood vessels. In severe attacks of plague in man the pulse is often rapid and irregular, which was not the case in the monkeys.

In tests of sensitivity of *P. pestis* to various antibiotics BRYGOO and COURDURIER (p. 313) found that the most active were chloramphenicol, aureomycin, oxytetracycline, streptomycin and neomycin; but even with these the width of the inhibition zone was usually less than 5 mm. QUAN *et al.* (p. 991) investigated the sensitivity of *P. pestis in vitro* and *in vivo* to 4 substances. The order of sensitivity *in vitro* was: — chloramphenicol, thiomycetin, sulfisoxazole and sulphadiazine; *in vivo*: — chloramphenicol, sulphadiazine, thiomycetin and sulfisoxazole. The last two are more rapidly excreted than the others. Spiramycin is bacteriostatic at 1–10 mgm. per ml. for *P. pestis*, but BRYGOO (p. 1339) shows that daily doses of 100 mgm. per kgm. for 3 days were not effective in mice inoculated with 5 LD50. ANCHEZAR *et al.* (p. 313) found that isoniazid was useless in experimental plague.

KARTMAN and LONERGAN (p. 182) describe a bait-box for the control of fleas on wild rodents in the area of Hawaii where wild-rodent plague exists. When entering and leaving the box the rat is dusted with DDT, and therefore carries DDT into its burrow. This can be associated with a bait containing Warfarin, to kill the rats. *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

BULL. WORLD HEALTH ORGANIZATION. Geneva. 1956, v. 15, Nos. 3, 4 & 5, 513–48, 613–784. **Malaria.**

Dr. L. G. BRUCE-CHWATT (pp. 513–48) analyses the weights of the spleen and liver as found in 4,285 selected records of autopsies held in Lagos, comparing them with those of a similar series of 933 autopsies at the London Hospital for Sick Children and several series recorded in the literature. Weight of the spleen is given in absolute terms and in proportion to the body weight, the liver weight and the weight found in contrasting groups. In the European child the spleen at birth constitutes 0·25% of the body weight, increasing slowly to slightly over 0·3% and continuing in that proportion throughout life. In the African child the spleen at the time of birth constitutes 0·41% of the body weight, 1·64 times that of the European. Thereafter the spleen increases to constitute 0·52 and later 0·85% of the body weight, but there is considerably more variation in the African than in the European records, both in the form of distribution round the median and variation from age to age. In the African newborn child the liver weighs proportionately slightly more than that of Europeans, the difference becomes more pronounced and averages 16·6% during the first two years of life, after which the difference is irregular and progressively smaller. The conclusion is drawn that the enlargement of the spleen and, so long as it lasts, of the liver in African children is due to the holoendemic malaria to which they are exposed. The enlargement of the spleen in newborn infants must be due to an intra-uterine hypertrophy, perhaps as a response to toxins circulating in the maternal blood. The results of spleen censuses among African children in Lagos are presented and by comparison with the distribution of spleen rates at autopsy it is concluded that among children the spleen becomes palpable when it is 1·6 times the normal weight and in adults when it is 2·5 times the normal. Estimates of spleen weight are given to correspond with the various classifications of spleen size according to HACKETT, CHRISTOPHERS and DARLING. [This is an admirably factual study adding considerably to knowledge and of interest to all concerned in the meaning of the spleen rate.]

Professor G. MACDONALD (pp. 613–626) gives an account of the application of his analyses of epidemiology to practical problems of control, dealing considerably with the influence of immunity and the types of survey mechanism which are most useful. There follows another general paper by P. M. BERNARD (pp. 627–634) reviewing failures in efforts towards complete closure of transmission by imagicidal measures in Africa,

concluding that success is possible and that campaigns should be pressed to the point of eradication. If this is not carried out there may well be a diminution of interest, particularly on the part of Governments, leading to the cessation of financial support, and there may possibly also be development of resistance in the mosquito. There is then an account of holoendemic malaria in New Guinea by D. Metselaar (pp. 635–649). He analyses the inoculation rate, the size of the spleen, and the spleen rate at different ages, together with relevant information on parasite rates. He concludes that the classification of malaria, developed at the Kampala Conference, into holo- hyper- meso- and hypo-endemic types is not applicable to New Guinea and some new classification is needed.

The succeeding papers are accounts of local surveys and control measures, each of them being detailed and complete with information on such matters as parasite and spleen rates, the nature of the vector, and prevalent species of malaria parasite. Only matters of special interest in them are here referred to. The survey of malaria in Sarawak and Brunei by J. De Zulueta (pp. 651–671) is considerably more extensive than any previously recorded. The incidence of malaria was in many places much lower than had been expected, high degrees only being found in places of sloping land which favoured the breeding of the main carriers, *Anopheles leucosphyrus balabacensis* and *A. leucosphyrus*. Racial differences in incidence appeared to be attributable to matters of habit rather than genetic character. The forms of naturalistic control recommended by McArthur [this *Bulletin*, 1947, v. 44, 788] do not seem applicable for any large-scale programme which should be based, as elsewhere, on imagicidal practice. J. De Zulueta and F. Lachance (pp. 673–693) describe a considerable scheme in which DDT and BHC were used and which resulted in great reduction of the parasite rate in the course of 21 months, from which it is concluded that full control can be achieved and might be pressed to eradication.

H. M. Archibald makes a comparison of conditions in the north and south of Nigeria. Notably malaria in the northern parts is very seasonal, transmission being virtually brought to an end by a long and extremely dry season, during which mosquitoes are rare and the sporozoite rate drops to very low levels. The disease is there seasonal and to some extent epidemic. He reviews the mortality and morbidity, considering that the latter may be more marked in the north, and briefly states the grounds on which a control programme was devised.

The account of malaria control in Madagascar by G. Joncour (pp. 711–723) extends that previously given by Bernard [*ibid.*, 1954, v. 51, 1037]. It is of particular interest owing to the considerable use of mass treatment in conjunction with imagicidal practice, chloroquine having been given weekly to all children under the age of 13, and the widespread success achieved is attributed largely to the use of this combination of measures.

An account by M. Ciuca (pp. 725–751) of work carried out in Rumania is particularly welcome and interesting. It describes the epidemiology of

malaria in that country and the measures taken to study and control it. A campaign started in 1947 was first based on control measures and then from 1949 onwards has developed in 4 stages. The first was one of general imagicidal control. The second was one of consolidation of that control, and institution of the treatment of residual cases together with the further training of staff. In the third imagicidal control was discontinued in many areas though barrier protective zones were maintained, and in the fourth period starting in 1955 efforts are directed entirely towards the total eradication of malaria from the country. There is a considerable statement of epidemiological investigations, including an interesting account of the study of possible resistance to insecticides by anophelines during this campaign, though none was found to develop. It includes an account of unsuccessful attempts to synthesize any material degree of resistance in the laboratory. A strain of *A. m. atroparvus* was exposed to insecticide over 15 generations and though minor changes occurred there was no marked or persisting resistance.

The description of malaria control in Yugoslavia by Č. Simič (pp. 753–766) covers events from 1918. It includes the programme which started in 1947 and which was deemed to have achieved the first phase of success in 1950 when it was discontinued in places. Happenings since that time include a recurrence of malaria in one area which might have been attributed to the development of resistance in mosquitoes, though this was factually disproved, and the outbreak was brought under control by a strengthening of administrative measures.

Particular problems in Morocco are described by G. Houel (pp. 767–774). The most intense foci of malaria are fairly localized and in regions of intensive agricultural development. Much of the rest of the country is sparsely populated and the people are largely nomadic. A part of the control programme must therefore be based on the revision of agricultural practice and control of breeding within rice plantations. A general imagicidal scheme throughout the country is considered impracticable and drug treatment must be the main form of defence. Normal forms of chemoprophylaxis are widely practised and drugs are used in the control of any outbreaks, details being given of the schedules used and the degree of success achieved.

The series closes with an account by H. M. Archibald and L. J. Bruce-Chwatt (pp. 775–784) of experiments in the suppression of malaria in Nigerian schoolchildren by the weekly administration of 25 mgm. of pyrimethamine carried out over 2 years. A group of 219 children is considered, the group being divided into 2 halves: one receiving the drug and the other acting as a control. Results of treatment on the occurrence of parasitaemia were immediate and sustained. The parasite rate in the treated group fell from 48·7% to zero within a short time. Periodic examinations were made and a few infections were found in treated children. Most were among those recently returned from holiday during which they had not received the drug, but there were 11 cases in which

small numbers of parasites were seen without explanation. The experiment was considered to have been fully successful. The children were weighed and measured systematically during this period and it is recorded that the gain in weight in treated children was significantly greater than that in those receiving no drugs, and this may be taken as an indication that the treatment contributed to their general welfare.

G. Macdonald

Archibald, H. M. **The Influence of Malarial Infection of the Placenta on the Incidence of Prematurity.** *Bull. World Health Organization.* Geneva. 1956, v. 15, Nos. 3, 4 & 5, 842–5. [Refs. in footnotes.]

A study of the relationship between malarial infection in the placenta and prematurity of birth previously described by Bruce-Chwatt [this *Bulletin*, 1953, v. 50, 596] was continued to enlarge the series from 73 to 512, of which 77 or 15% were positive for malaria parasites, mainly *Plasmodium falciparum*. Of 68 apparently full term deliveries from mothers with infected placentae 29·4% of infants weighed 5½ lb. or less, whereas 16·5% of those from mothers with uninfected placentae were of this weight or below. The difference is significant and is maintained when consideration is restricted to second and subsequent births.

It is concluded that malarial infection of the placenta may account for the premature birth of 2% of all infants in south-west Nigeria, and this prematurity carries a high neonatal and later mortality risk. It is worth considering the routine treatment of pregnant women with antimalarials, and it is not thought that this would materially interfere with their immunity and so act to their detriment. *G. Macdonald*

Misra, B. G. **Malaria in North-East Frontier Agency (India).** *Indian J. Malariology.* 1956, Dec., v. 10, No. 4, 331–47, 1 map. [17 refs.]

The North-East Frontier Agency constitutes the frontier districts separating Assam from Bhutan and Tibet on the north and from Burma on the south. It is mountainous, heavily wooded, subject to heavy rain between March and October, and sparsely populated by tribal people. In 35 villages examined the spleen rates varied from 2·6 to 100% and the parasite rate from zero to 81·8%, *Plasmodium falciparum* predominating over *P. vivax* and *P. malariae*. The species of anophelines found were *Anopheles maculatus*, *A. aconitus*, *A. minimus*, *A. vagus*, *A. annularis* and *A. pallidus*. Sporozoites were found in 1 specimen of *A. minimus* and not in the other species, but the numbers examined were for seasonal reasons very small. On circumstantial grounds it is believed that *A. minimus* is the principal carrier.

It is concluded that malaria is hyperendemic in the foothills but absent from the heights except in so far as it is introduced by migrants. Control would involve recurrent application of residual insecticide in hillfoot

villages, suppressive treatment of all migratory people and travel porters, and the avoidance of creation of malariogenic conditions during developmental processes in the area. *G. Macdonald*

Postiglione, M. & Venkat Rao, V. **Malaria in Burma. A Review.** *Indian J. Malariology.* 1956, Dec., v. 10, No. 4, 273–98, 2 maps. [Numerous refs.]

Much of the literature of malaria in Burma is hidden in unpublished or inaccessible reports, but it is here collected in a bibliography, summarized, and critically reviewed to give a complete account of the country. For description Burma is divided into four regions: the hill tracts, the central dry plains, the delta, and the coastal strip running from the Bengal frontier to Tenasserim and Malaya.

In the hill tracts malaria is perennially transmitted, hyperendemic, due about equally to *Plasmodium falciparum* and *P. vivax* though *P. malariae* is also present, and transmitted mainly by *Anopheles minimus*, though *A. leucosphyrus* (*? balabacensis*) may also be important and *A. philippinensis* has been found infected. A full statement is given of the known bionomics of these species in Burma together with briefer information on *A. culicifacies*, *A. jeyporiensis* and *A. maculatus* which also occur in the hill tracts.

Malaria is absent from most of the plains except in foothill areas and where extensive irrigation systems exist, being carried in the former by *A. minimus* and in the latter by *A. culicifacies*.

Malaria is distributed in a very patchy manner through most of the delta and in most places occurs as irregular sharp localized epidemics often associated with failure of the monsoon. There is, however, an area of higher endemicity near the Pegu hills. The meagre information available includes a record of two gland infections in 300 *A. maculatus* dissected, but the relative importance of this species, of *A. culicifacies* and of *A. minimus* is not certain.

Malaria is widely present in the coastal regions; it may have been recently introduced into some parts of the Arakan coast but is now and has for some time been hyperendemic there. Transmission is probably perennially maintained but increased at special seasons in different districts. The anophelines include *A. minimus*, *A. annularis*, *A. sundaicus* and *A. jeyporiensis* (*? candidiensis*). Gland infections have been found in *A. annularis*, *A. minimus* and *A. jeyporiensis*. It is thought that *A. annularis* is the most important local carrier and that perhaps *A. sundaicus*, which has been incriminated on analogy from elsewhere, may be locally harmless. Good accounts of the locally recorded biology of these species are included.

[This critical review is particularly welcome because the abstracter knows well the inaccessibility of most of the literature.]

G. Macdonald

Griffith, D. H. S. & Lim Swee Choo. **An Epidemiological Exercise on Malaria in the District of Perak North.** *Med. J. Malaya.* 1956, Dec., v. 11, No. 2, 139–52, 4 figs. & 1 map.

Perak North is a flat, partially water-logged area largely devoted to rice cultivation, where the malaria incidence is normally low and which enjoys little systematic malaria control. Such malaria as occurs is mainly from the district of Krian where incidence in the general population is 0·5 per 1,000. However, the incidence in estates of Krian which enjoy much more ample preventive and curative medical services is 27 per 1,000. It is assumed that many cases go unrecorded in the general population.

The records show considerable numbers of infant deaths attributed to convulsions and a correlation (0·21) is shown between their monthly incidence and that of malaria. It is concluded that 20% of deaths from convulsions are attributable to malaria, and a calculation leading from this suggests that during the year reviewed 78 infants died from malaria, and that the morbidity among infants amounted to 51 per 1,000.

Malaria is shown to be commonest in Krian about April and again in June, being related to rainfall. It is thought that there may be a chain of events leading from infection among plantation employees to the general population and again back to estate employees at another season. Further work is recommended to enquire into these suggestions.

[The authors accept the limitation that they should work exclusively from facts, that is statistics, available to the Health Office, and that their calculations are based upon a wealth of assumptions. Undoubtedly field work would be needed to substantiate the numerical order of happenings.] *G. Macdonald*

Hsieh, H. C. & Liang, K. C. **Residual Foci of Malarial Infection in the DDT-Sprayed Area of Taiwan.** *Bull. World Health Organization.* Geneva. 1956, v. 15, Nos. 3, 4 & 5, 810–13.

Four foci of malaria have been detected in Taiwan where 3 years of island-wide residual house-sprayings with DDT have otherwise given effective control. All the foci are in foot-hill valleys populated by a poor community widely dispersed in substandard houses and rather inaccessible. Population movements and changes are considerable. Although several social factors may be contributing to these failures of malaria control, there is need also to investigate whether or not the vector is *Anopheles minimus minimus* in these areas as elsewhere on the island; the behaviour of this important vector may be different in the conditions of the foci and in a way materially affecting the success of residual spraying.

D. S. Bertram

See also p. 883, Lewis, **Some Insects of Medical Interest from Pepel and Tasso Islands in Sierra Leone.**

De Meillon, B. **Aspects of Malaria Vector Research in Africa.** *Bull. World Health Organization.* Geneva. 1956, v. 15, Nos. 3, 4 & 5, 847–51.

This is an essay summarizing in an interesting and readable way some current problems in the biology and control of *Anopheles gambiae* and, to a lesser extent, *A. funestus* and its related forms. The conclusion is a call for intensified research on the biology of vectors of malaria in the African continent.

D. S. Bertram

Garnham, P. C. C. **Microsporidia in Laboratory Colonies of** *Anopheles*. *Bull. World Health Organization.* Geneva. 1956, v. 15, Nos. 3, 4 & 5, 845–7, 2 figs.

This paper describes briefly, and figures, stages of a microsporidian, apparently *Plistophora culicis*, in laboratory cultures of *Anopheles gambiae* and *A. stephensi*. Gut, salivary glands and, particularly, Malpighian tubes and fat body may be heavily infected. There has been little or no evidence as yet of ill-effects on the mosquito or the development of its malaria parasites. The encysted mass of spores, the pansporoblast, on a stomach of a mosquito bears a superficial resemblance to an oöcyst but should not be misidentified on proper examination.

D. S. Bertram

Senevet, G., Andarelli, L., Duzer, A. & Lieutaud, A. *Anopheles multicolor* dans le Tell algérien. III.—Une station dans le plaine du Chélif. [*Anopheles multicolor* **in the Algerian Tell. III. A Site in the Chélif Plain**] *Arch. Inst. Pasteur d'Algérie.* 1956, Dec., v. 34, No. 4, 550–51.

The authors have already recorded the presence of *Anopheles multicolor* in the coastal regions of Algeria, in the neighbourhood of Ténès [this *Bulletin*, 1955, v. 52, (740); 1956, v. 53, 1214].

They have now found larvae and adults of this species in the Zemmora region at the foot of the hills bordering the Chélif plain to the south.

They have also found a male *Culex deserticola* in the barracks at Zemmora and this is the most northerly record in Algeria which they have so far encountered. They comment on the finding in this region of two species of mosquito reputed to be characteristic of the Sahara area.

H. J. O'D. Burke-Gaffney

Gramiccia, G. *Anopheles claviger* **in the Middle East.** *Bull. World Health Organization.* Geneva. 1956, v. 15, Nos. 3, 4 & 5, 816–21. [Refs. in footnotes.]

Anopheles claviger is widely spread in the Middle East. It is difficult to asses its role as a vector of malaria under rural conditions but it is

thought probable that it does play some part in transmission. It is not well controlled by residual sprays against adults and a case is put forward for antilarval measures as well for the first 2 years of a malaria control programme. This conclusion is based on a consideration of the literature and a good deal of careful observation throughout the year on the behaviour and breeding of *A. claviger* in the village of Deddé (Koura) in the Lebanon. *D. S. Bertram*

Livingstone, F. B. **Sickling and Malaria.** [Correspondence.] *Brit. Med. J.* 1957, Mar. 30, 762–3.

The discussion on the relative immunity of sickle-cell trait carriers to *Plasmodium falciparum* malaria has now reached the stage where the actual mechanism of this immunity is being explored. Miller *et al.* [this *Bulletin*, 1956, v. 53, 1312]—pointing out that red cells containing *P. falciparum* in its advanced stages of development are not seen in the peripheral blood but adhere to the walls of the blood vessels, usually in the internal organs—suggested that therefore these cells would be giving up oxygen to both the parasites and to the adjoining tissues. Thus, in a sickle-cell trait carrier these cells would therefore more easily sickle *in vivo* and be more easily phagocytosed. This might be the basis of the sickler's relative immunity to malignant malaria. If by this mechanism *P. falciparum* infections of the placenta could not develop in sickling women to the same extent to which they can do so in normal mothers sickling women should have a proportionally higher number of liveborn infants. The author has calculated that to maintain a sickling rate of 26% this proportion would have to be 1·44. This ratio seems rather high, but it takes into account that only about half of the sickling children are actually children of sickling mothers, and that only one-half of the sickling mothers' offspring will themselves be sicklers. Furthermore, one would not except this mechanism to be solely responsible for the balanced polymorphism by which the sickling trait is maintained in malarious regions.

Raper [*ibid.*, 1956, v. 53, 1044] has shown that sicklers do not seem to suffer from cerebral malaria to the same extent as normal children. Some evidence therefore exists which supports the concept of immunity of one organ in preference to others. Edington's finding of a greater fertility rate in sickling mothers with some evidence of a higher survival rate of their offspring [*ibid.*, 1955, v. 52, 925] would support the theory that the placenta is another such organ which is more protected against *P. falciparum* malaria when the woman is a sickler. Edington's observations were made in the Gold Coast where the sickling rate is 20%. To maintain such a frequency by this mechanism the proportion of children born to sickling women to those born to non-sickling mothers would have to be 1·29. Combining Edington's figures for the fertility rate with those

for the offspring survival rate one finds that the contribution of sickling mothers to the next generation is 2·69, and that of the non-sickling mothers 2·0. This amounts to a ratio of 1·34. The author urges that investigations along these lines should be carried out in regions where malignant malaria is endemic and where the sickling frequency is high.

H. Lehmann

GLICK, L. **Fatal Agranulocytosis during Treatment with Amodiaquine.** [Memoranda.] *Brit. Med. J.* 1957, Apr. 20, 932.

In the treatment of malaria, chloroquine and amodiaquine are usually given in short courses; side-effects are commonly few and mild and they are usually reversible on withdrawal of the drugs.

The extension of the use of these drugs over long periods to treat skin diseases in which photosensitivity is an important factor introduces new hazards. In the treatment of lupus erythematosus with chloroquine thrombocytopenia and severe leucopenia have occasionally been seen: in a similar series in which amodiaquine was used, these effects were not encountered. The author now records a case of fatal agranulocytosis after the use of amodiaquine.

A woman of 53 had a rash on her face and forehead which seemed to be aggravated by sunlight. She was given 200 mgm. amodiaquine daily for some 8 weeks, when she developed a sore throat which was presumed to be a quinsy. The drug was stopped and replaced by penicillin. After three days' treatment there was no response, the patient became irrational, could not open her mouth and was thought to have neck rigidity. She was clearly very ill and meningitis was suspected. Examination of the mouth (with difficulty) showed a sloughing ulcer, surrounded by erythema, on one tonsil and inflammation of the other. Numerous laboratory examinations were made and these included full blood examination. The white cells were 3,500 per cmm., all lymphocytes: on the following 3 days respectively, the counts were 600, 450 and 350 per cmm. The lymphocytes never fell below 99% and the sternal marrow showed marked hypoplasia of the granular series.

Despite full treatment with penicillin, prednisone and pyridoxine, the patient went steadily downhill and died on the fifth day in hospital.

Autopsy showed congestion and oedema of the brain and lungs, with small areas like infarcts in the latter organs. The large bowel as far as the splenic flexure was thickened because of oedema. There was a diffuse fine fibrosis of the myocardium and early arteriosclerotic changes in the kidneys. The liver was of "nutmeg" appearance and the spleen about twice the normal size. There were enlarged mesenteric lymph nodes. The ulceration of the fauces and tonsils was apparent and there was slight erosion of the lower end of the oesophagus. The bone-marrow appeared to be normal.

[For a case of agranulocytosis during treatment of amoebiasis with camoform, see this *Bulletin*, 1957, v. 54, 571.]

H. J. O'D. Burke-Gaffney

Institut Pour la Recherche Scientifique en Afrique Centrale. Septième Rapport Annuel 1954. 267 pp., illustrated. La lutte antipaludique en Afrique au sud du Sahara. [**Institute for Scientific Research in Central Africa. Seventh Annual Report, 1954. Malaria Control in Africa South of the Sahara**] [Vincke, I. H.]. 69–91, 8 figs. [Numerous refs.] 1956. Brussels: 42, Rue Montoyer.

This clear and comprehensive account is prepared for medical people who do not specialize in malaria but whose decisions may considerably influence policy. It describes the rationale of imagicidal attack, illustrating its effects on mosquito longevity by some of the author's observations on their age grouping as revealed by oviduct measurements. There follows an account of the factors influencing insecticidal efficiency and of the grounds on which insecticides should be chosen and their dosage decided.

The difficulties encountered in Africa are discussed, two of the main ones being psychological resistance by people with a belief in the value of immunity, and the characteristics of *Anopheles gambiae* which make it extremely difficult to control. Study of this mosquito is therefore essential—appropriate techniques being outlined, and there is a balanced statement on the value of immunity.

The author proceeds to a general statement of the principles of eradication of malaria and concludes that present thought should be in terms of eradication and not the diminution of malaria. A study of the techniques particularly appropriate to Africa would be necessary and the author places his hopes in the association of chemoprophylaxis with insecticidal attack. Many people are sceptical on the subject and particularly of the willingness of the population to cooperate, but to secure this perhaps neither discipline nor evolution is necessary but in their place a much improved system of public relations and education in which specialized sociologists can participate to advantage.

[The account is lucid and logical, and the abstracter hopes it will have a wide circulation.] *G. Macdonald*

Sobky, M. F. **What a "Malaria Eradication" Programme would imply in Egypt.** *Bull. Endem. Dis.* Baghdad. 1957, Jan., v. 2, Nos. 1/2, 1–7, 1 map.

Egypt, a country of 16 million people, has long been malarious and first undertook control on the advice of Sir Ronald Ross in 1901. It was continued in a diverse fashion until 1936 when a formal Malaria Control Section of the Medical Department was established. This has enlarged

and undertaken various tasks including the eradication of *Anopheles gambiae*. It has undertaken both larvicidal and imagicidal practice with DDT but until 1953 the latter was restricted to one province, Fayoum; resistance to DDT as a larvicide was then met in culicines and imagicidal practice became more widespread. Systematic blood surveys reveal that the general parasite rate of the country had fallen to 0·12% in 1953, since when it has slightly risen.

There has been some extension of imagicidal practice and a scheme is now presented for the eradication of malaria by this means. The country is divided into 3 areas, east of the delta, the delta and west of it, and Cairo and Upper Egypt. It is proposed to spray for 3 years in each of these areas, to run a collateral system of blood examination and treatment of positive cases and to follow spraying with a surveillance mechanism lasting 3 years. Present staff will be used. The cost is expected to rise from £311,614 in the first year to a maximum of £1,005,078 in the third and fall again to £236,703 in the fifth year.

G. Macdonald

Andary, M. J. **Progress of the Malaria Control Programme, Administrative Patterns, Advisability and Practicability of Eradication in Lebanon.** *Bull. Endem. Dis.* Baghdad. 1957, Jan., v. 2, Nos. 1/2, 8–14, 2 maps.

Malaria control, though carried out in places for years before, was first organized in Lebanon in 1947, and by 1951 imagicidal practice had become general in malarious areas. Between 1951 and 1953 a WHO demonstration team consolidated results, making thorough studies in those places where difficulty had been encountered and helping in the training of a force of technicians. Spleen and parasite rates recorded for 4 main regions are now very low, and an eradication scheme is proposed. For this purpose the 71 sectors of the country are grouped into 3 classes: residual spraying will be carried out in 18 lying mainly in the rift valley and along the northern border of the country; limited imagicidal or larvicidal measures will be carried out in 38 sectors where endemicity is known to be low, and in the remaining 15 sectors no measures will be undertaken. The preliminary organization has been undertaken and general agreement achieved, but financial aspects are still being studied.

G. Macdonald

Farid, M. A. **The Implications of *Anopheles sergenti* for Malaria Eradication Programmes East of the Mediterranean.** *Bull. World Health Organization.* Geneva. 1956, v. 15, Nos. 3, 4 & 5, 821–8. [Refs. in footnotes.]

Anopheles sergenti is considered an efficient vector of malaria wherever it exists in the arid regions of North Africa and the Middle East countries. Many of the adults rest out-of-doors in caves and rock fissures and biting

occurs out-of-doors as well as indoors. Indoor residual sprays are not generally effective in eradicating this species.

Recommendations for dealing with *A. sergenti* are put forward as follows. If indoor residual spraying is expected to be successful, it should be applied to every kind of structure within 6½ km. of the breeding places and a month before the seasonal peak is due. If this method is not likely to succeed and the areas are inhabited and accessible, larvicide treatment with chlorinated hydrocarbons is recommended so long as there is no sign of resistance to these compounds in the mosquito adult population, and other vector species, *A. sacharovi*, *superpictus* or *pharoensis*, are absent from the breeding places. If either of these criteria is not satisfied, there would seem to be some indication for resorting to Paris green or oil. If *A. sergenti* is breeding alone in inaccessible places and is an important vector, residual insecticides, such as DDT and dieldrin, are indicated.

It seems necessary to ban rice-growing where *A. sergenti* co-exists and breeds with other vector species which are controllable by indoor residual sprays. Paris green or oil would be prohibitively expensive, and larval control by residual insecticides may induce insecticide-resistance in one or more of the several vector species. The ban could be lifted when malaria eradication is achieved.

Anti-mosquito measures should be accompanied by drug therapy and prophylaxis, and education. *D. S. Bertram*

Fakir, M. T. **Rice Field Malaria and its Control.** *Bull. Endem. Dis.* Baghdad. 1957, Jan., v. 2, Nos. 1/2, 15–18.

There are extensive rice fields in 4 areas of Syria and their product contributes materially to the country's national income. They constitute breeding grounds for *Anopheles hyrcanus*, *A. sergenti* and *A. pulcherrimus*. Malaria is seriously prevalent in their neighbourhood and is almost certainly carried by *A. sacharovi* and *A. superpictus*.

The reason for the association of malaria with rice fields is not clear. It is suspected that the acknowledged vectors might resort to rice fields as breeding grounds if they were controlled in their usual breeding and hibernating places, and it is said that this has happened in one part of Syria. To prevent this it is proposed that a law should be enacted providing that rice could only be planted after the grant of a permit, for which there would be required a deposit of 20 Syrian pounds for each acre of land together with a report on the area by a committee. The cultivator would then be required to level the land, limit its irrigation to one side and to one channel, supply drains to dispose of surplus water and ensure the drying of the fields for 48 hours every week, and add DDT in emulsion form to the irrigation water. Failing compliance he should forfeit his deposit and the work should be carried out at his expense by Government. [The proposed measures appear extremely rigorous.]

G. Macdonald

KHATRI, L. D. **Some Observations on the Interruption of spraying of Insecticides in the Dindi Ayacut Area in Nalgonda District of Hyderabad State, India.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1956, Nov., v. 4, No. 6, 179–85, 1 folding map.

Malaria first became prevalent in the area described in 1940 on the introduction of irrigation, and led to the introduction of a combined larvicidal and imagicidal (pyrethrum) control programme. The discontinuation of this control led to epidemics in 1945 when spleen rates averaged 36·3% and ranged up to 82·5%. Control was re-instituted, from 1947 it was carried out with DDT residual spray, and again discontinued in January 1954. In 1955 the spleen, parasite and infant parasites rates were, respectively, 0·2%, 0·3% and zero. Malaria does not appear to have recurred or been re-introduced despite cessation of control.

G. Macdonald

CHOW, C. Y. & SOEPARMO, H. T. **DDT-Resistance of *Anopheles sundaicus* in Java.** *Bull. World Health Organization.* Geneva. 1956, v. 15, Nos. 3, 4 & 5, 785–6.

Indoor residual spraying with DDT at 2 gm. per sq. metre has been carried out in the city of Semarang in Middle Java since January 1953. Earlier, 1945 to 1948, there had been larvicidal treatments with DDT from the air and the ground, in and around the city.

The present paper reports the existence of resistance to DDT in the malaria vector concerned, *Anopheles sundaicus*, mosquitoes from Semarang being probably at least 10 times more tolerant of DDT than those from an unsprayed area, Jepara. It is thought that the larvicide treatments may have played a part in building up the resistance. The resistance was detected by the BUSVINE and NASH test [this *Bulletin*, 1954, v. 51, 1028]. The numbers of *A. sundaicus* occurring and the incidence of infant malaria about 2 years after the residual spraying began was the first indication that resistance had developed. Tests of the efficacy of dieldrin justify a change from DDT to dieldrin.

D. S. Bertram

SEZEN, N. **Studies in the Life Cycle of Two Strains of *Plasmodium inui* and the Development of Immunity.** *Türk Ijiyen ve Tecrübî Biyoloji Dergisi.* Ankara. 1956, v. 16, No. 3, 240–42. [34 refs.] [Fuller version in Turkish 232–40, 1 graph.]

Two strains of *Plasmodium inui* (from Dr. J. D. Fulton, Medical Research Council, London, and Dr. Leon Schmidt, Christ Hospital, Cincinnati, respectively) were studied in acute and chronic infections (of blood and sporozoite origin) in 13 rhesus monkeys. The Turkish text gives details of each case, while an extensive English summary illustrates the essential features.

The length of the asexual cycle of the blood forms was 72 hours; as the infections progressed, synchronicity of the cycle was lost. This form of malaria never proved fatal. As many as 14 and as few as 3 merozoites per schizont were found; in general the largest numbers were present at the beginning of the attack, with a decrease by as much as 40% at the crisis when abnormal forms were frequent. Thereafter the average merozoite number returned to normal. Early in the attack parasitaemia increased directly in proportion to the numbers of merozoites produced in each generation; later, with the development of immunity, it was shown that more than 90% were destroyed. Splenectomy of infected monkeys gave rise to numerous Howell-Jolly bodies in the erythrocytes.

P. C. C. Garnham

See also p. 825, Sergent, De la coexistence, chez le même malade, de la fièvre récurrente et du paludisme. [**The Co-Existence in the Same Host of Relapsing Fever and Malaria**]

Sergent, Ed. & Poncet, Alice. Étude expérimentale du paludisme des Rongeurs à *Plasmodium berghei*. VI. Cycle évolutif schizogonique de la plasmodie. [**Experimental Study of Malaria due to** *P. berghei* **in Rodents. VI. Schizogonic Cycle of the Plasmodium**] *Arch. Inst. Pasteur d'Algérie*. 1956, Sept., v. 34, No. 3, 287–344, 1 fig. & 21 graphs (11 coloured). [Refs. in footnotes.]

The authors continue their study [see this *Bulletin*, 1957, v. 54, 12] on the K 173 strain of *Plasmodium berghei* by describing in detail the course of the blood infection in two animals, a white mouse (representing the most susceptible) and a white rat (with considerable innate resistance). These two animals were selected out of many thousands studied, and are representative of the infection in general.

The infections are studied *vis-à-vis* the red blood cell picture, against the mature erythrocytes and the immature, divided into polychromatophils (with basophilic cytoplasm throughout) and reticulocytes (with basophilic granules in an acidophilic cytoplasm). The results are illustrated vividly in a number of graphs with lines of a different colour representing each type of red cell, and in similarly coloured histograms, with hatching to represent degree of parasitaemia.

The daily progress of the infection was observed in fresh blood and in stained films; both methods gave much the same figures of parasite density. The parasitaemia reached its height in both animals in the middle of the attack and then declined to the day of death in the mouse or of cure in the rat. The infection caused a wholesale destruction of erythrocytes in the mouse, the count falling as early as 24 hours after intraperitoneal inoculation of parasites and diminishing by about a million per cmm. of blood daily, until the death of the animal on the sixth day

when the erythrocytes were reduced to 1,600,000. The course of the anaemia in the rat was quite different: after one day the erythrocyte loss was profound—a quarter were destroyed, but the number then remained constant for a week when a further drop occurred (to 3½ million per cmm.); the anaemia continued for another week, after which the blood picture gradually returned to normal (in 3 weeks). The anaemia in the mouse was a loss of mature corpuscles, the polychromatophils decreased in proportion, but the reticulocytes disappeared entirely on the last two days of the infection. In the rat the anaemia consisted of a gradual loss of mature corpuscles and a rapid decline in the number of reticulocytes, but in this animal the polychromatophils rose during the infection to reach a figure of nearly a quarter of the total red count.

In the mouse 39% of the normocytes were parasitized on the 3rd day; in the rat only 2% at the acme of the infection. In the mouse up to 100% of the polychromatophils were attacked, while in the rat 92% were attacked on the 6th day, but only 0·3% on the 13th day when this form of corpuscle was most prevalent. The reticulocytes were invaded in large numbers in both animals during the height of the attack; in the rat, towards recovery, an intense reticulocytosis occurred unaccompanied by invasion of parasites.

It is suggested that the great preference of *P. berghei* for immature corpuscles is perhaps due to the greater permeability of the cuticle.

The asexual stages of growth of the parasite were assessed in 3 categories—ring forms, solid trophozoites and schizonts. Both in the mouse and rat the numbers of parasites in these stages ran parallel during the infection; free schizonts in the plasma were much more numerous in the mouse. Schizogony was of normal, perfect form in normocytes and reticulocytes, but growth was poor in the polychromatophils and maturation of the parasite was rarely attained. The course of infection in the rat was followed after the end of the acute phase on the 14th day. A light relapse occurred on the 34th day, but this had no effect either on the total red blood count or on the proportions of mature and immature elements (the latter still being high). The rat was challenged with the homologous strain 19 months after infection, but failed to respond.

P. C. C. Garnham

Hawking, F. & Terry, R. J. *Plasmodium berghei*, **Milk Diet and P-Hydroxybenzoate.** *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 151–6, 2 figs. [Numerous refs.]

This communication deals with the development of *P. berghei* in rats fed on different diets. Since Maegraith and colleagues [this *Bulletin*, 1953, v. 50, 384] described the suppressive effect of milk diet on this infection much has been written on the subject [*ibid.*, 1953, v. 50, 1121, 1122; 1954, v. 51, 468, 538, 772, 773; 1955, v. 52, 338, 516, 750; 1956, v. 53, 406, 546], and many different views expressed on the value of milk as a suppressant. The present authors found no regularity in suppression

of *P. berghei* infection in rats of 200 gm., on a milk diet. The nature of bacterial flora and their synthetic capabilities in the host gut have been considered. Treatment of the host with antibiotics gave confusing results as regards suppression. Irregular effects on parasitaemia were also caused by caecectomy and administration of magnesium sulphate. The use of suckling rats fed on mothers kept on deficient diet seemed more promising. Suppression of malarial infection was alleviated by giving PAB or PAB + POB (*p*-hydroxybenzoic acid) directly. Experiments on reversal of suppression like those carried out by Thompson *et al.* on *P. lophurae* gave similar results with *P. berghei* [*ibid.*, 1953, v. 50, 912].

[In spite of the large number of papers listed no reference is made to the fact that the significance of *p*-hydroxybenzoate for the nutrition of *P. berghei* has previously been recognized [*ibid.*, 1954, v. 51, 468], a finding which was then repudiated by the senior author [*ibid.*, 1954, v. 51, 538], when milk diet was used. Likewise no reference is made to a recent review on the very subject of nutrition of *P. berghei* [*ibid.*, 1956, v. 53, 546]. Other references such as that on "Milk Diet and Human Malaria" [*ibid.*, 1955, v. 52, 334] most pertinent to the subject, should surely have been included.] *J. D. Fulton*

Sautet, J., Pastacaldi, V. & Vuillet, J. Action de l'alcoolisme sur l'évolution de l'infection à *Plasmodium berghei* chez la souris. [**Action of Alcohol on the Development of** *Plasmodium berghei* **Infections in Mice**] *Bull. Soc. Path. Exot.* 1956, July–Aug., v. 49, No. 4, 640–47, 1 fig.

Further observations [see this *Bulletin*, 1956, v. 53, 863] have been made on the effect of including red wine in the diet of white mice (18 to 20 gm.) infected with standard doses of *Plasmodium berghei*. The animals were placed on the special diets 4 weeks before inoculation, and were in 4 groups: (a) red wine standardized to 10° alcohol (40 cc. per kgm.), (b) red wine without alcohol, (c) corresponding amount of 95% ethyl alcohol and (d) controls. The parasitaemia progressed more rapidly in the alcoholic mice, while death occurred more quickly in mice fed on wine with or without alcohol. Histological study of the liver and spleen failed to demonstrate any significant differences in the 4 groups.

P. C. C. Garnham

Fraser, Dorothy M. & Kermack, W. O. **The Inhibitory Action of some Antimalarial Drugs and Related Compounds on the Hexokinase of Yeast and of** *Plasmodium berghei*. *Brit. J. Pharmacol. & Chemotherapy*. 1957, Mar., v. 12, No. 1, 16–23. [17 refs.]

This investigation deals with the action of antimalarial and other drugs on the enzyme hexokinase from different sources including the malaria

parasite *Plasmodium berghei*. The enzyme is concerned with the phosphorylation of glucose which is a probable step in its metabolism by the parasite. It was hoped to find out whether inhibition of the enzyme could be correlated with antimalarial activity of the drugs used. Previously, for example, it was suggested [this *Bulletin*, 1946, v. 43, 824, 825] that mepacrine (quinacrine) interfered with the hexokinase activity of *P. lophurae*, by competition with adenosine triphosphate (ATP), a coenzyme of hexokinase, or by combination with it. Hexokinase was obtained from *P. berghei* after haemolysis of its red cell host [*ibid.*, 1945, v. 42, 967], and was determined in the presence of ATP by a chemical or a manometric method. The best working temperature was found to be 20°C. at *p*H 7·6. Chemical compounds other than antimalarials were able to inhibit hexokinase. The results depended to some extent on whether the drugs were in contact with the hexokinase before being mixed with substrate. It appeared from data obtained that the drug was reacting with the enzyme rather than with ATP. Other experiments in which the concentration of ATP was varied suggested competition between it and the drug. The concentration of glucose affected the results but little, whereas that of ATP did.

The hexokinase activity of parasitized cells was much greater than that of mature erythrocytes or of reticulocytes. In general there was a close similarity in behaviour of yeast hexokinase and that of *P. berghei* towards a number of drugs. All antimalarials inhibited yeast hexokinase but so also did other substances without antimalarial action. All antimalarials except proguanil inhibited *P. berghei*-hexokinase, and some correlation existed between this property and antimalarial activity. Not all hexokinase inhibitors had antimalarial properties. The validity of any theory of antimalarial action based on activity against parasite-hexokinase would appear to be ruled out. *J. D. Fulton*

Ray, A. P., Sharma, G. K. & Misra, B. G. **Screening of Antimalarials against *P. gallinaceum* in Chicks. Part VI. Evidence of Two-Fold Acquired Resistance to Chloroquine Diphosphate in a Strain of *P. gallinaceum* in Chicks.** *Indian J. Malariology.* 1956, Dec., v. 10, No. 4, 299–304. [20 refs.]

The literature contains many references to acquired resistance to antimalarials such as primaquin, proguanil and pyrimethamine in different plasmodial infections [this *Bulletin*, 1942, v. 39, 438; 1947, v. 44, 969; 1948, v. 45, 48, 1066; 1949, v. 46, 219, 709]. In the case of quinine, however, only 2-fold resistance was demonstrable against *Plasmodium gallinaceum* [*ibid.*, 1948, v. 45, 158]. Resistance has not been demonstrated in the case of mepacrine or chloroquine [*ibid.*, 1952, v. 49, 673].

In the present investigation a mild degree of resistance, approximately 2-fold, was established against *P. gallinaceum* after exposure to drug

during 57 passages over a period of approximately 9 months. Each dosage schedule consisted of 7 doses, the first being administered on the day of inoculation and thereafter twice daily for 3 days. On the following day counts of parasites present in the blood were made. Sometimes, because of the non-appearance of resistance, the dosage of drug was maintained unchanged in a series of 12 consecutive batches of chickens. The minimum effective dose (MED) which reduced parasitaemia to 25% of that in controls was approximately 0·06 mgm. per 50 gm. chick and an initial dosage of 0·05 mgm. was used in production of a resistant strain. Attempts are being made to increase the 2-fold resistance attained.

[See this *Bulletin*, 1957, v. 54, 399.] *J. D. Fulton*

Schinazi, L. A. & Ball, G. H. **Changes in Infectivity of** *Plasmodium relictum* **for Avian Hosts.** *Exper. Parasit.* New York. 1956, Nov., v. 5, No. 6, 541–50, 2 figs.

The 1P1-1 strain of *Plasmodium relictum* was tested for its infectivity to canaries and pigeons. The parasite had originally been isolated from the pigeon, passed to canaries and maintained in these birds by blood passage and mosquito passage through *Culex pipiens*.

Canary to pigeon passage gave rise to parasitaemias as high as 5,500 per 10^4 erythrocytes, which were sometimes fatal. Intravenous transfers from pigeon to pigeon before and after passage through *Culex tarsalis* gave rise to variable parasitaemias. Canaries were successfully infected from pigeons. Although pigeons could be infected by sporozoites, the resultant parasitaemia was low; it was also low if the pigeon was inoculated with blood from a canary whose infection had been immediately derived from sporozoites; successive pigeon transfers gradually restored the virulence of the strain. *P. C. C. Garnham*

Garnham, P. C. C. **Trees, Ticks and Monkeys: Further Attempts to discover the Invertebrate Host of** *Hepatocystis kochi*. *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 91–6. [12 refs.]

The mode of transmission of *Hepatocystis* (= *Plasmodium*) *kochi*, and of any species belonging to this genus, has remained undiscovered in spite of their wide distribution in nature and many investigations on their life-cycle. The author discusses the significance of tick-borne infections in African monkeys, which are infected both with piroplasms, known to be transmitted by hard ticks, and spirochaetes which are transmitted by soft ticks, either *Argas* or *Ornithodorus*.

These observations suggested that ticks might be concerned in the

transmission of *H. kochi* and therefore careful examinations were made of trees used as dormitories by monkeys to find out what biting arthropods were present. The results were disappointing, only a few examples of *Rhipicephalus simus* being found; there were also specimens of the Lygaeid, *Harmostica* sp. and various fleas, including *Xenopsylla versuta*. However, monkeys were commonly found to be infected with *Rhipicephalus appendiculatus* and *Amblyomma* sp. soon after capture. Various species of hard and soft ticks were allowed to feed on monkeys heavily infected with *H. kochi* but the results were uniformly negative.

Edward Hindle

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:*—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

Van Bogaert, L. & Dubois, A. Sur l'encéphalite expérimentale à *Trypanosoma gambiense* chez le hamster de Syrie (*Mesocricetus auratus*). [**Experimental Encephalitis due to** *Trypanosoma gambiense* **in the Syrian Hamster** (*Mesocricetus auratus*)] Reprinted from *Rev. Belge Path. et Méd. Exper.* 1956, July, v. 25, No. 3, 257–64, 7 figs. on 2 pls. [10 refs.]

Two strains of *Trypanosoma gambiense*—VDG and Tshimbi—were used to infect mice, guineapigs and Syrian hamsters, and to observe the effect on the brain of these animals. The VDG strain was the more virulent, causing a prolonged parasitaemia in hamsters which sometimes died after 5 months; the brain lesions were most pronounced in hamsters and with the VDG strain. The effect on the brain was of the same character but much slighter in guineapigs and mice and with the Tshimbi strain. In hamsters the VDG strain gives rise to cerebral lesions closely resembling those found in man. There is a basal meningo-encephalitis, and a gross infiltration of the choroid plexus. The small blood vessels of the cortex next become affected and small necrotic areas rarely develop. The adventitious cells are lymphocytes, plasma cells, giant cells and morula cells, plus microglial cells from the brain matter itself.

The hamster is thus a useful animal in the study of trypanosomiasis; unfortunately it is difficult to take repeated blood films from it.

P. C. C. Garnham

Baker, J. R. **Stylomycin as a Therapeutic Agent in *Trypanosoma rhodesiense* Infections in White Rats.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1957, Mar., v. 51, No. 2, 183–5.

Previous reports have appeared on tests with the antibiotic Stylomycin [Puromycin] in laboratory infections of *T. gambiense* and *T. rhodesiense* maintained by syringe passage [this *Bulletin*, 1955, v. 52, 134]. It was found possible to prevent appearance of parasites in the blood of animals by repeated dosage with drug starting from the time of inoculation. Favourable reports on the treatment of human patients were also recorded [*ibid.*, 1955, v. 52, 615].

The present author has carried out tests with a freshly isolated strain which was maintained by cyclical passage from insect vectors to guinea-pigs, and from the latter rats were infected by blood passage. The rat hosts were treated intraperitoneally with the drug, starting one or more days after appearance of trypanosomes in their blood. Cure was presumed if trypanosomes were not seen during a period of 70 days after cessation of treatment. Two experiments were carried out with 12 and 45 rats, respectively, some being left untreated as controls. Dosages of antibiotic varying from a total of 300 to 720 mgm. per kgm. were given, starting 3 or 6 days after appearance of parasites in blood. The blood of all rats was cleared within 4 days but many relapsed. A total of 6 rats were apparently cured, the others died from infection or were poisoned by the drug. It was concluded that it was improbable that Stylomycin would prove of value in treatment of *T. rhodesiense* infections in man.

J. D. Fulton

Ramakrishnan, S. P., David, A. & Nair, C. P. **Observations on a Natural (Cryptic) Infection of Trypanosomes in Sparrows (*Passer domesticus* Linnaeus). Part III. Morphology of the Developmental Forms in *C. fatigans*.** *Indian J. Malariology.* 1956, Dec., v. 10, No. 4, 313–15, 56 figs. on 6 pls.

Culex fatigans females were allowed to engorge on sparrows and nightingales infected with trypanosomes [see this *Bulletin*, 1956, v. 53, 161]. Smears of gut contents were stained 4 to 72 hours after the mosquitoes had fed, and for periods up to 30 days. Multiplication in a leishmanial and crithidial form took place in the mid-gut from 24 hours onwards, and between the 4th and 19th days the hindgut became packed with developmental forms of the parasite (chiefly leptomonad and crithidial stages). Infection also proceeded anteriorly and the foregut sometimes contained tightly packed clusters of flagellates. Similar clusters consisting of crithidial and slender adult forms were found in the salivary glands. In the so-called adult forms the elongate nucleus lay in the posterior third close to the kinetoplast

Mosquitoes are probably not a suitable invertebrate host and the cycle

of development is not only irregular but results in the production of only a few metacyclic forms. *P. C. C. Garnham*

Ramos, A. da S. & Lima, Helena M. de A. Nota sôbre o achado ocasional do *Trypanosoma cruzi* em exames hemoscópicos. [**Occasional Finding of *Trypanosoma cruzi* in the Course of Blood Examinations**] *Folia Clin. et Biol.* S. Paulo. 1955, Apr.–June, v. 23, Nos. 4/6, 149–50.

The English summary appended to the paper is as follows:—

"The authors described 20 more cases of Chagas' disease from various areas of the interior of the Estado de São Paulo whose diagnosis was detected through the occasional findings of parasites in doing routine examinations for malarial parasites."

Jörg, M. E. Limite sud de la dispersion geografica de *Triatoma infestans* y su infestacion por *Trypanosoma cruzi* en Argentina. [**Southern Limit of Distribution of *Triatoma infestans* and its Infection with *Trypanosoma cruzi* in Argentina**] *Folia Clin. et Biol.* S. Paulo. 1955, Apr.–June, v. 23, Nos. 4/6, 115–32, 8 figs. (6 on 6 pls.).

The English summary appended to the paper is as follows:—

"This study describes a trial to establish the southern limit of the dispersion area of the common cone nose bug of Argentina: *Triatoma infestans* by means of systematic explorations realized over many villages of the following states (Gobernaciones): Río Negro, Chubut, Comodoro Rivadavia and Santa Cruz. 323 specimens were collected. Infection with *Trypanosoma cruzi* was determined through microscopic examination of intestinal contents in coloured thick film slides. 7·43% of the specimens showed infection. *Triatoma infestans* was found down South just to 44°45′ Lat. S. and specimens infected with *T. cruzi* down just to 43°15′ Lat. S., these restricted to coastal area.

"The possible bioclimatic influences which are determinative of the southern limit of the dispersion of *T. infestans* are discussed. Prevalent importance of temperature is considered and coincidence of the limit of dispersion area with some isotherms is shown."

Kraus, Carola. Versuch einer morphologischen und neurophysiologischen Analyse des Stechaktes von *Rhodnius prolixus* Stål 1858. [**Morphological and Neurophysiological Analysis of the Feeding Mechanism in *Rhodnius prolixus***] *Acta Tropica.* Basle. 1957, v. 14, No. 1, 36–87, 22 figs. & 1 chart. [47 refs.]

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

Arnaki, M., Soysal, S. S. & Stary, Z. Über Veränderungen im Kohlenhydratgehalt der Serumproteine bei Kala-Azar. [**Changes in the Carbohydrate Content of the Serum Proteins in Kala Azar**] *Klin. Woch.* 1957, Apr. 15, v. 35, No. 8, 420–21. [12 refs.]

It is well known that the serum of kala azar patients shows an increase in globulins, particularly in gamma globulin. In 5 children examined the percentages of gamma globulin (normally 11%) were, respectively, 31·2, 40·0, 41·7, 66·8, and 41·5. In addition the carbohydrate content of the gamma globulin was increased in kala azar. The normal average carbohydrate content of gamma globulin is 790 mgm. %. In three cases quoted in detail it was 2,320, 3,880 and 3,900 mgm. %, respectively. The carbohydrate content of the beta globulin was unchanged, but that of the alpha globulins was lowered rather than raised. *H. Lehmann*

Pringle, G. **Oriental Sore in Iraq: Historical and Epidemiological Problems.** *Bull. Endem. Dis.* Baghdad. 1957, Jan., v. 2, Nos. 1/2, 41–76, 2 maps. [Numerous refs.]

In his fascinating historical review the author examines but rejects suggestions as to the great antiquity of human dermal leishmaniasis. The plague of boils recorded in Exodus IX, ii (circa 1230 B.C.) cannot be attributed to an epidemic of this disease in the Nile Valley, while the forms of therapy practised in the ancient civilizations of the Tigris-Euphrates basin exclude any applicable to chronic ulcers. No mention of the disease can be found in the teachings of the great Islamic medical schools which flourished in this region from the tenth to the thirteenth centuries A.D. However, there is biological evidence of an enzootic form of the disease of great antiquity in the gerbils and ground squirrels of the Central Asian steppes, of which the vector is *Phlebotomus caucasicus*, a close relative of *P. sergenti*.

The author suggests that the human disease arose by the adaptation of a previously zoophilic strain of *Leishmania tropica* to transmission through the medium of *P. sergenti*, a highly anthropophilic sandfly. The human disease was well known in the great Central Asian plain east of the Caspian by the tenth century A.D., under the name of " Balkh Sore ". From this area, it appears to have spread south-westwards over the Caucasus into Anatolia, Iraq and the Levant, where it was recorded very graphically from Aleppo by a travelling English physician, Dr. Russell, in 1756. It is of interest that he writes of a " male " or superficial, non-ulcerative and of a " female ", moist or ulcerative type, which appear analogous to the two varieties recorded by modern Russian workers [see

this *Bulletin*, 1944, v. 41, 331] and are attributed by them to differing strains of the parasite. South of the Caucasus, its spread into Iraq and Iran appears to have been mediated by the natural distribution of *Phlebotomus sergenti*, while it is suggested that a further modification of the leishmania adapted it to transmission through *P. papatasi*, which carried it through the Levant to the Mediterranean littoral. It is surprising to learn that the disease was not introduced into the Iranian plateau until the nineteenth century. There is evidence that while the Eastern or *sergenti*-transmitted strain is in regression, the Western, *papatasi*-transmitted strain appears to be vigorously extending its range and intensity.

The author records the epidemiology of the disease in Iraq, where it is most frequent in the central region round Baghdad. In some quarters of this city 70 to 100% of the inhabitants carry scars of the disease. Its intensity follows the density distribution of *P. sergenti*, but the ecological factors governing the latter are not fully understood. The maintenance of the human disease from a canine reservoir is improbable; it is possible that horses in rural districts may provide a reservoir from which the parasite may be passively transferred to abraded surfaces in man by muscid flies. Man appears to be the predominating reservoir animal.

The author describes briefly leishmania recidiva cutis, a lupoid type of reaction devoid of leishmania and histologically identical with skin tuberculid. Rising at the edge of a healing oriental sore, the lupoid leishmanid extends centrifugally to cover as much as half the face, ultimately subsiding to leave a disfiguring scar.

[This paper is distinguished by its admirable historical and epidemiological review, which merit study in the original.] *J. H. Walters*

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

Kołłoto, Barbara. Dur wysypkowy w województwie białostockim w latach 1946–1954. [**Typhus Fever in the Białystok District in 1946–54**] *Przegląd Epidemiol.* Warsaw. 1957, v. 11, No. 1, 11–19. 4 figs.

The English summary appended to the paper is as follows:—

" In the Białystok District during the first years after the Second World War, there was a considerable incidence of typhus fever. This incidence,

though the number of cases was constantly decreasing, was of an epidemic character until 1950. In later years cases appeared sporadically, and it was not possible to establish the source of infection. The incidence of recrudescences rose, constituting epidemiologically and clinically a separate group.

"In 1954, 33 cases of typhus were noted in the Białystok District. These included 9 recrudescences. The epidemiology and clinic of these cases is discussed."

Kostrzewski, J., Grużewski, A. & Milewska, Lucyna. Dalsze rozważania nad możliwością przewidywania nawrotów duru wysypkowego. [**Further Remarks on the Possible Anticipation of Recrudescences of Typhus**] *Przegląd Epidemiol.* Warsaw. 1957, v. 11, No. 1, 21–6, 2 figs.

The English summary appended to the paper is as follows:—

"Investigations on recrudescences of typhus in Poland carried out in 1952–55 have furnished new observations, which permit the supplementation of the lists of recrudescences collected from the foreign literature published in 1953. In order to ascertain the relation between the recrudescences of typhus and the period elapsing from the first onset of illness, calculations have been again made. These show that, in agreement with the former calculations, recrudescences begin to appear in increasing numbers 6–10 years after the first onset of illness and their number increases rapidly during the next 10–15 years. The further course of the curve illustrating the wave of recrudescences, however, differs from what was previously supposed, since it attains its peak presumably after the elapse of 18–20 years, and then very slowly subsides for a period of 20–50 years. If the assumption and the calculation resulting from it were correct, then in Poland we may continue to expect a rise during the next few years in the numbers of recrudescences of typhus from the epidemic which occurred during the Second World War, and after 1960 these numbers should gradually diminish."

Reiss-Gutfreund, Ruth J. Un nouveau réservoir de virus pour *Rickettsia prowazeki*: les animaux domestiques et leurs tiques. [**A New Reservoir for** *Rickettsia prowazeki*: **Domestic Animals and their Ticks**] *Bull. Soc. Path. Exot.* 1956, Sept.–Oct., v. 49, No. 5, 946–1021, 8 figs. [71 refs.] Discussion 1021–3.

This paper describes work undertaken to ascertain the mode of survival of *Rickettsia prowazeki* between the 2 outbreaks of typhus fever which occur annually in Ethiopia, one in June, at the beginning of the rainy

season, and the other in December and January, the coldest months. A few sporadic cases may be seen during the inter-epidemic period, but evidence of direct contact between patients is seldom found. Possible hypotheses are discussed at length.

In serological studies, 7·5% of 544 human sera from patients attending a venereal disease clinic in Addis Ababa gave positive agglutination tests at a titre of more than 1 in 640 with *R. prowazeki* antigen. Sera from domestic animals reacted at a titre of more than 1 in 640 as follows: zebu cattle—21% of 172; sheep—14% of 248; goats—18% of 229. By inoculating suspensions of blood clot into guineapigs, strains of rickettsiae were isolated from 3 of 19 apparently healthy animals (1 goat and 2 sheep) and from 1 of 7 persons (a woman who had suffered from a short feverish illness 7 days before the blood was collected). The pathogenicity and serological characters of these strains were identical with those of classical strains of *R. prowazeki*.

Having demonstrated that *R. prowazeki* may be harboured by domestic animals, the author investigated the possibility of tick transmission. Guineapig inoculation with suspensions of pooled ticks led to the isolation of 6 strains of *R. prowazeki*: from *Amblyomma variegatum* (cattle)—2 strains; from *Hyalomma rufipes* (cattle)—1 strain; from *H. rufipes* (host uncertain)—1 strain. These strains were readily transmissible to human lice by feeding on infected rabbits or by anal inoculation. Larvae and nymphs, but not adults, of *Amblyomma variegatum*, *A. lepidum*, *Hyalomma rufipes* and *Rhipicephalus simus* were also infected from rabbits. No development occurred in ticks at temperatures below 25°C.

From these results, it seems that domestic animals and their ticks may form a reservoir of *R. prowazeki* and that 2 cycles of infection may occur in certain tropical countries: (1) domestic animal—tick—domestic animal, and (2) man—louse—man. The cycles may be linked through the accidental infection of man by ticks.

[This contribution is of notable interest. As Giroud remarked in a discussion which followed the presentation of the paper, the finding of *R. prowazeki* in the blood of domestic animals, and in their ticks, will entail modification of existing ideas on the conservation of the organism of epidemic typhus.] *R. S. F. Hennessey*

Benoist, F., Giroud, P., Héraud, G. & Lelièvre, A. Méningite à liquide clair. Résurgence de typhus exanthématique. [**Aseptic Meningitis and Relapsing Typhus**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1957, Nos. 9/10, 246–8.

———, ———, ——— & ———. Tuberculose pulmonaire et typhus récurrent. [**Pulmonary Tuberculosis and Recurring Typhus Fever**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1957, Nos. 9/10, 251–3.

Benoist, F., Giroud, P., Héraud, G. & Lelièvre, A. Le typhus murin et sa récurrence. [**Relapsing Murine Typhus**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1957, Nos. 9/10, 248–50.

See this *Bulletin*, 1954, v. 51, 786.

Terada, H., Watanabe, S. & Tamaki, A. **Inhibitory Effect of Chemotherapeutics on the Oxidation of Sodium Glutamate by possibly Purified Rickettsial Suspension.** *Acta Med. et Biologica.* Niigata. 1956, July, v. 4, No. 1, 59–65, 2 figs.

Embryonated eggs were incubated for 5–6 days at 37°C. and then inoculated *via* the yolk sac with 0·2 ml. of a standard suspension of the Wilmington strain of murine typhus, and re-incubated at 35°C. for 6 days. The contents of the infected yolk sac were then diluted 1 in 25 in a salt phosphate buffer solution at *p*H 7·5. After centrifuging at 5,000 r.p.m. for 45 minutes the deposit was taken up in the same salt-buffer solution to 5% of the original, 0·1 ml. trypsin was added per ml. of suspension, and this was then put in a water bath at 35°C. for 15 minutes. The suspension was then chilled, recentrifuged, and the deposit again taken up in salt-buffer solution. This was the final suspension used and was a milky yellowish-white fluid. Sodium glutamate was added to give a concentration of 50 μM per ml. and the rate of oxygen uptake was measured manometrically in a Warburg manometer at 34·5°C.

The antibiotics tested were aureomycin, oxytetracycline, chloramphenicol, tetracycline, erythromycin, carbomycin in concentrations of 10, 50 and 200 μgm./ml. A seven-membered ring compound Hinokitiol-Natrium (Hi-Na) was also tested in a concentration of 0·1 μgm./ml.

In the absence of antibiotic, oxygen uptake of the suspension in 10 experiments gave a mean value of 51·83 ml. after 60 minutes and 79·80 after 120 minutes. Among the antibiotics the greatest inhibitory effect was shown with aureomycin, which in a concentration of 200 μgm./ml. caused a 90% inhibition. The other antibiotics were also inhibitory but to a lesser degree.

The compound Hi-Na was much more effective and gave an 80–90% inhibition at a concentration of 0·1 μgm./ml. *Mary Barber*

Katsura, S., *et al.* **Further Experience of Treatment of Tsutsugamushi Disease with a Very Small Amount of Chlortetracycline (Aureomycin) or Tetracycline (Achromycin) in a Long Term.** *Acta Med. et Biologica.* Niigata. 1956, Dec., v. 4, No. 3, 241–58, 3 figs. [10 refs.]

"In 1955 we treated 34 patients of tsutsugamushi disease in Niigata-Prefecture with the modified scheme of our small-amount long-term

antibiotic treatment. The total amount of the antibiotics (chlortetracycline and tetracycline) for a single case was mostly 1·0–1·5 g. i.e. 1/5–1/10 of the amount usually applied, and the term of medication lasted about 3 weeks. By this method, we have had only 2 cases of relapse among 34 (5·9%) cases. The relapse rate obtained by our small-amount long-term antibiotic method prior to the modification was 17·4% and 15·2% respectively. These rates are at any rate by far the better than those obtained by the short-time method with even larger amount antibiotics (66·3%–88·9%). Further, taking both our results in 1955 and those until 1954 in consideration, we may say that the difference between the effect of CTC [chlortetracycline] and TC on patients with this disease is not obvious, though in animal experiments CTC resulted in a little longer survival days than TC [tetracycline]."

[See this *Bulletin*, 1954, v. 51, 481; 1955, v. 52, 1181; 1956, v. 53, 567.]

Katsura, S., Katsuta, K. & Aoike, T. **On Small-Amount Long-Term Antibiotic Treatment of Shichitô-Fever.** *Acta Med. et Biologica.* Niigata. 1956, Dec., v. 4, No. 3, 259–63, 1 fig. [15 refs.]

"We have shown two cases of Shichitô-fever which were treated by our small-amount long-term antibiotic treatment method and cured smoothly without relapse. The antibiotic and total amount used was in one case 1·0 g. CTC [chlortetracycline] and in another 1·0 g. TC [tetracycline]."

Schaechter, M., Bozeman, F. M. & Smadel, J. E. **Study on the Growth of Rickettsiae. II. Morphologic Observations of Living Rickettsiae in Tissue Culture Cells.** *Virology.* New York. 1957, Feb., v. 3, No. 1, 160–72, 26 figs. [21 refs.]

Division of *Rickettsia rickettsi* by binary fission was observed by phase microscopy of tissue cultures (the 14pf strain of rat fibroblasts) infected with this organism. Reproduction of *R. tsutsugamushi* in this system could not be followed with accuracy, as growth occurred in large clusters near the nucleus of the infected cell, with periodic cycles of dispersion and aggregation. *R. rickettsi* was loosely scattered throughout the cytoplasm, occasionally appearing in the nucleus, and could be kept under observation for long periods. Rickettsiae were often carried away from a cell by cytoplasmic processes which showed a high degree of mobility; it is thought that dissemination of organisms between cells may occur by this means, although the majority are probably released by rupture of infected cells. While *R. rickettsi* was never present in such large numbers as was *R. tsutsugamushi*, cellular degeneration occurred earlier

with *R. rickettsi* (5–6 days as compared with 8–9 days). [For Part I, see this *Bulletin*, 1956, v. 53, 1415.] *R. S. F. Hennessey*

Cawley, E. P. & Wheeler, C. E. **Rocky Mountain Spotted Fever.** *J. Amer. Med. Ass.* 1957, Mar. 23, v. 163, No. 12, 1003–7, 6 figs. [10 refs.]

The authors give a general account of the aetiology and manifestations of Rocky Mountain spotted fever. It is noted that 4,517 cases were reported in the United States during the 10 years 1945 to 1954 and a map indicates the distribution of the infection. The authors illustrate their clinical description by case records of 4 of the 74 patients treated at the University of Virginia Hospital during the same 10-year period. During the first 7 to 10 days of the illness the diagnosis rests on the likelihood of a tick bite and on clinical signs, notably the fever and characteristic rash. *Proteus* agglutination is usually positive between the 10th and 15th days of the disease. The rash and the perivascular infiltration with cells, chiefly mononuclear, are well illustrated. Without treatment, the prognosis is worse with increasing age. The tetracyclines and chloramphenicol are effective; sulphonamides are contraindicated.

Frederick J. Wright

Sautet, J. Présence de la maladie de Derrick (fièvre Q) à Marseille. [**Presence of Q Fever in Marseilles**] *Bull. Acad. Nat. Méd.* 1957, v. 141, Nos. 9/10, 174–5.

Q fever has been reported in France, either in the form of sporadic cases or as small epidemics and up to now has nearly always been present, the authors state, as an occupational disease [this *Bulletin*, 1953, v. 50, 300].

Since it has been found in a number of areas in the south-west and in Avignon, one might expect to find it in an active transit port such as Marseilles.

The author records briefly the case of a foreman at the Marseilles abattoirs who had a fever in 1956 which responded to aureomycin: in 1957 he had another mild fever which also responded to aureomycin. In this instance, X-ray showed a wedge-shaped opacity in the hilar lung field and inoculation of the patient's blood into guineapigs resulted in a febrile attack. Rickettsiae were found in the animals' spleens and the serum of one of them agglutinated *R. burneti* at 1 in 20.

Several of the patient's colleagues who were also in contact with sheep showed the same symptoms and serological studies are to be made. The sheep came to Marseilles from North Africa, southern France or the Paris basin, according to season. It is likely that the patient was infected from handling sheep.

The author notes that this case was apparently a relapse, in spite of antibiotic treatment, and comments that although aureomycin gave excellent clinical results animals could nevertheless be inoculated successfully with the patient's blood. *H. J. O'D. Burke-Gaffney*

Di Sapio, G. & Lecaldano, E. Sulla diffusione della febbre Q in Campania e sul valore delle reazioni di deviazione del complemento e di agglutinazione microscopica. [**The Distribution of Q Fever in Campania, and the Value of the Complement-Fixation and Microscopical-Agglutination Reactions in Diagnosis of the Disease**] *Riv. Istituto. Sieroterap. Ital.* 1957, Jan.–Feb., v. 32, No. 1, 47–60. English summary.

The primary object of the study described in this paper was to estimate the relative value of the complement-fixation test and the microscopical type of the rickettsia-agglutination test for Q fever.

The tests successfully carried out were on 466 human, 228 ovine and 332 bovine sera. Of the human sera 131 were from persons living in Naples, of whom only 4 reacted at titres of 1 in 8 or over with the complement-fixation test; the remaining 335 were from persons living in various places in rural Campania; of these 39 gave positive reactions. Among 228 sera from sheep in several widely distributed areas of Campania 24 were positive and among 352 cattle 25 were positive. If titres of 1 in 4 were regarded as positive the numbers of reactors in all the above groups would be more than double.

Among 173 samples of serum of which 62 were human, 58 were from sheep and 53 were from cattle, comparative tests with fixation and agglutination tests gave concordant results in 148 sera and discordant results in the remaining 25; in 6 of the discordant reactions, the fixation test was positive and the agglutination test negative, in the other 19 the fixation test was negative and the agglutination test positive. The latter reaction in addition to being more sensitive was found to remain positive in most cases for longer periods after the illness than was the case with the fixation test. It was considered desirable to carry out both tests in every case.

In 15 persons who had been ill during the previous two or three years a retrospective diagnosis of Q fever was made by these tests; 2 of the patients lived in Naples, the other 13 had sporadic attacks occurring in 12 different localities, which were grouped in 3 well defined zones of Campania.

An epidemiological survey provided evidence pointing strongly to transmission of the disease to man by contact with infected sheep or cattle.

[Comparative trials of serological tests for Q fever on the lines of those described in this paper deserve more attention than they have received in the past.] *John W. D. Megaw*

Wojciechowski, E., Lewińska, Zofia & Mikołajczyk, E. Przegląd serologiczny w kierunku gorączki Q niektórych grup ludności w Polsce. [**Serological Survey of Q Fever in certain Population Groups in Poland**] *Przegląd Epidemiol.* Warsaw. 1957, v. 11, No. 1, 59–63.

The English summary appended to the paper is as follows:—

"In the period from 1952 to 1956 the serum of 249 patients with symptoms of atypical pneumonia or symptoms suggesting Q fever, coming from several towns in Poland, and the serum of 305 individuals from Warsaw and the close vicinity, was examined for Q fever with negative results. On the other hand, a serological examination of 560 workers in the Warsaw abattoirs carried out in 1952–53 showed five cases with a positive complement fixation with Nine Mile antigen with a titre of 1:16, and 32 cases with a titre of 1:8. In view of the negative epidemiological enquiry, it may be assumed that there was only a sporadic incidence of Q fever in the abattoirs. The agglutination test made by the technique of hanging microdroplets and read under the microscope gave a very large percentage of unspecific results."

Oleś, A. & Kurzeja, K. Zachorowania ludzi podczas epidemii gorączki Q w województwie rzeszowskim. [**The Course of the Disease in Humans during an Outbreak of Q Fever in Rzeszów District**] *Przegląd Epidemiol.* Warsaw. 1957, v. 11, No. 1, 81–4.

The English summary appended to the paper is as follows:—

"The first outbreak of Q-fever which took place in the spring of 1956 in a small locality of southern Poland was caused by an imported flock of sheep. The human infections comprised 63 cases, chiefly amongst personnel of a breeding farm which occurred during the lambing and shearing season. The diagnosis was confirmed in 35 cases by complement fixation tests and in one case by isolation of the virus. The illness has been running without fatal cases, older patients displaying more severe symptoms."

Oleś, A., Kurzeja, K., Lewińska, Zofia & Frygin, C. Przegląd serologiczny zwierząt domowych w pierwszym ognisku gorączki Q w Polsce. [**Serological Survey of Domestic Animals in the First Focus of Q Fever in Poland**] *Przegląd Epidemiol.* Warsaw. 1957, v. 11, No. 1, 85–9.

The English summary appended to the paper is as follows:—

"The flock of sheep which caused the first outbreak of Q-fever in Poland, and the domestic animals from this epidemic focus and from surrounding areas were submitted to serological investigation for Q-fever by means of the complement fixation test, using Henzerling and Nine

Mile antigens of *R. burneti*. The imported infected flock of sheep (274 heads) showed 73·6 per cent positive complement fixation results, the flock grazing in neighbouring pasture-ground (311 heads) 3·7 per cent, and sheep in surrounding villages (176 heads) only 1·1 per cent. The cattle (297 heads) showed positive serological tests in 0·9 per cent only, while dogs (23) and goats (5) were serologically negative. The Henzerling Q-fever antigen appeared to be more sensitive than Nine Mile."

Wojciechowski, E., Wnęk, S., Lewińska, Zofia & Frygin, C. Badanie serologiczne w kierunku gorączki Q grupy zwierząt rzeźnych i hodowlanych. [**Serological Examination for Q Fever in a Group of Animals for Slaughter and Breeding**] *Przegląd Epidemiol.* Warsaw. 1957, v. 11, No. 1, 65–8.

The English summary appended to the paper is as follows:—

" Serological examinations for Q fever were carried out on 1114 animals for slaughter coming from central, eastern, and north-eastern districts of Poland, including 932 cows, 122 calves, and 60 sheep. In addition, 119 cows from two breeding farms near Warsaw were examined. Of the cows for slaughtering, 0·8 per cent showed a positive complement fixation with Henzerling antigen with a titre of 1:8, and 1·8 per cent showed fixation with Nine Mile antigen (11 serums gave a titre of 1:16 and 6 gave 1:8). The results for both antigens were in agreement in 8 cases (0·8 per cent). The cows for breeding showed a positive complement fixation with both antigens in 3 cases (2·5 per cent), of which two had a titre of 1:8 and one of 1:16. The agglutination test, made by the method of hanging microdroplets, gave a large percentage of positive results; the specificity of these results, however, raises considerable doubt."

Rehn, F. & Radvan, R. Isolace *Coxiella burneti* z klíštěte *Ixodes ricinus*. [**Isolation of** *Rickettsia burneti* **from the Tick** *Ixodes ricinus*] *Československ. Epidemiol., Mikrobiol., Imunol.* Prague. 1957, v. 6, No. 2, 85–8.

The English summary appended to the paper is as follows:—

" The authors examined 2322 hungry nymphae and imagos of the tick Ixodes ricinus captured in south-eastern Bohemia. The region that the ticks were got from was a natural focus of tick-borne encephalitis and lymphocytic choriomeningitis. From the examined ticks C. burneti was isolated. The new strain showed minimal antigenicity on homologous antiserum and in crossed complement fixation a mutually different relation to the Henzerling strain and the strain isolated in Switzerland. During serological testing of wild and domestic animals positive titres were obtained from a roe, a pheasant, and a cow. The authors point out

the special character of the region in which clearly marked places with the optimal biotope for ticks and wild animals constitute some sort of microfoci."

DENGUE AND ALLIED FEVERS

Gear, J. & Reid, F. P. **The Occurrence of a Dengue-Like Fever in the North-Eastern Transvaal. I. Clinical Features and Isolation of Virus.** *South African Med. J.* 1957, Mar. 16, v. 31, No. 11, 253–7.

In April 1956 several visitors to an area bordering the Kruger National Park contracted an illness characterized by fever and acute joint pains of sudden onset, sometimes associated with sore throat, headache, conjunctival suffusion and a macular erythematous rash. The incubation period was between 2 and 6 days, the fever lasting from 2 to 7 days. Some patients developed arthritic nodules, while others showed signs of localized neuritis. Convalescence was generally slow, with recrudescences of painful stiffness; most patients recovered their normal health within 6 months. A similar illness was also observed among European and African residents of the area. A virus lethal to baby mice was isolated from the serum of 1 patient. This virus was neutralized by convalescent-phase serum, but not by acute-phase serum, from another person who had experienced the disease. The illness resembled dengue fever and a study of the virus (to be published separately) revealed that it was identical with, or closely related to, Chikungunya virus [isolated from cases of a dengue-like illness in the Newala District of Tanganyika in 1953; see this *Bulletin*, 1956, v. 53, 1334]. *R. S. F. Hennessey*

RABIES

World Health Organization. Technical Report Ser. No. 121. **Expert Committee on Rabies, Paris, 26 November–1 December 1956. Third Report.** 32 pp. [Refs. in footnotes.] 1957. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [1s. 9d.; $0.30; Sw. fr. 1.–.]

At its third session the Expert Committee considered the advances made in the field of rabies during the period September 1953 to December 1956 and, in the light of these advances, modified and expanded certain

sections of its second report [this *Bulletin*, 1955, v. 52, 149]. The present report, which should be read in conjunction with the second report, contains the Committee's main observations, conclusions and recommendations.

Results of investigations into the efficacy of anti-rabies serum and vaccine have shown that if passive antibody is maintained for too long a period by repeated doses of serum, or if fewer than 14 doses of phenolized vaccine are given even after a single dose of serum, there is definite interference by the serum with the antigenicity of the vaccine; it is recommended, therefore, that in the combined serum-vaccine prophylaxis of seriously exposed persons a single dose of serum should be followed by 14 or more doses of vaccine. As regards the problem of rabies prophylaxis in persons with unusual risk of repeated exposure, *e.g.*, veterinarians, solution may be sought in pre-exposure immunization, first by a course of potent vaccine and then, in order to elicit prompt and significant antibody rise, by a booster dose of the same vaccine given several months later; for people so prepared and subsequently exposed, another booster dose is suggested if exposure has been mild or moderate, and yet another one week later if exposure has been severe. Procedures are suggested for dealing most effectively with the complications of anti-rabies treatment—reactions to immune horse serum and the neuroparalytic syndrome occasionally associated with the administration of nervous tissue vaccine. Indications for specific post-exposure treatment of man differ in no essential detail from those in the second report [*loc. cit.*].

Experimental investigations into the immunization of animals show that puppies under 3 months of age not only fail to respond satisfactorily to pre-exposure treatment with chicken embryo or nervous-tissue vaccine, but that, as in the case of kittens less than 4 months old, an occasional animal will succumb to vaccine prepared from low (40th–50th) egg passage of the Flury strain (LEP); that nervous-tissue vaccine and both LEP and HEP (187th–210th egg passage of the Flury strain) vaccines protect adult cats against severe challenge with street virus; and that there is no evidence indicating that vaccine virus appears in the saliva or salivary glands of vaccinated animals, or that vaccination so modifies the resistance of an animal that, after its infection with street virus, subclinical infection associated with the salivary excretion of virus results.

Observations on rabies control in animals include: the inadvisability of routine vaccination of puppies and kittens; the possibility of annual revaccination with the 99th–101st egg passage of the Kelev strain, as an alternative to previous recommendations on canine immunization; and the use of chicken-embryo-adapted HEP Flury and Kelev strains for the pre-exposure vaccination of cattle, for which purpose a single 30 ml. dose of a 33% suspension of inactivated nervous tissue vaccine may equally well be employed.

In regard to potency tests and international standards for vaccine and sera it is noted that a Rabies Reference Vaccine is now available for

international use in the potency testing of nervous-tissue vaccines; that, because of the insusceptibility of adult mice to intracerebral inoculation with HEP Flury virus, an additional potency test for chicken embryo vaccine prepared from this strain has become possible—a test in which immunization and subsequent challenge of these animals are alike effected intracerebrally; and that, as a result of recent work on the designation of the International Standard Anti-Rabies Serum, the existing potency test applied to routine production batches of serum requires modification in the manner explained in the text and in the relevant annex.

A number of suggestions for future research completes the body of the report: studies on the efficacy of reduced vaccine schedules in human prophylaxis; efforts to discover a tissue culture system applicable to rabies virus production and serological tests; further evaluation of recently reported more sensitive methods of antibody demonstration; further enquiry into the mechanism of both artificially induced and " natural " resistance to rabies infection—to mention but a few.

Five annexes to the report contain, respectively, a suggested international veterinary certificate of health and rabies vaccination for dogs and cats; a statement on the availability and use of an international reference vaccine; a procedure for the preparation of freeze-dried challenge virus; a revision of the minimum potency requirements of anti-rabies hyperimmune serum; and a suggested case record for human rabies exposure. *G. Stuart*

Cilli, V. & Scatozza, F. Il frazionamento dei costituenti cellulari applicato alla ricerca del virus fisso della rabbia. Distribuzione del virus nel cervello di conigli paralizzati. Nota I. [**Fractionation of Cellular Material applied to the Study of Fixed Rabies Virus. Distribution of the Virus in the Brain of Paralysed Rabbits**] *Giorn. di Microbiol.* Naples. 1956, May–June, v. 1, No. 6, 471–80. [18 refs.]

The English summary appended to the paper is as follows:—

" The authors have applied the fractionated centrifugalization method according to Schneider's technique for studying rabies fixed virus. Parts of CNS of rabbits killed by bleeding during the paralytic stage of infection have been used and the following observations have been made; a) the nuclear and cytoplasmic fraction contain the same quantity of virus; b) inside the cytoplasmic fraction the microsomes present virus at the higher titre if compared with mitochondria and the soluble fraction; c) nuclei and microsomes contain a similar quantity of virus.

" As a conclusion of their paper the authors compare their results with the ones reported by the literature as far as poliomyelitis and herpes virus is concerned."

Jurkovsky, A. M. [**On the Purification of Fixed Rabies Virus from the Inert Substances of Brain Tissue**] *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii.* Moscow. 1957, v. 28, No. 2, 63–7. [In Russian.]

A 5% suspension in water of a rabbit brain infected with fixed rabies virus was clarified by low-speed centrifugation and treated with 1/20 part of Tovarnitskii's fluid. The mixture was then left overnight in the cold; the precipitate was recovered by centrifugation and resuspended in sterile distilled water. Nitrogen estimations showed that up to 52% of the brain protein could be removed by this means, and titrations carried out on 5 batches showed that the titre of the virus remained unchanged during the purification process. After freeze-drying the purified preparations retained titres slightly higher than those of dried unpurified suspensions. The dried purified preparations showed satisfactory antigenicity in mouse protection tests.

D. J. Bauer

Nikolitsch, M. & Jelesitsch, Z. Bestehen streng neurotrope Viren? [**Strict Neurotropism of Rabies Street Virus**] *Arch. f. Hyg. u. Bakt.* 1957, Mar., v. 141, No. 2, 104–9.

The English summary appended to the paper is as follows:—

"Up to the death of the animals, no virus could be detected in the blood of mice inoculated with the rabies street virus by the intramuscular route. In the brain, the virus has been demonstrated two days before the onset of clinical symptoms. The rabies street virus has been assumed to be strictly neurotropic."

Andral, L. & Gentile, A. Une méthode simplifiée de coloration des corps de Negri. [**Simplified Method of Staining Negri Bodies**] *Bull. Soc. Path. Exot.* 1956, Nov.–Dec., v. 49, No. 6, 1114–15.

The authors had difficulty in obtaining consistent results with Mann's stain and, after several trials, have found a satisfactory alternative which is rapid and simple. During the last 3 years they have used it for more than 600 histological specimens in the diagnosis of rabies. The results were controlled by the classical Mann technique and by biological tests.

Zenker's fluid is used for preference as a fixing agent, but failing that others such as Bouin's fluid or 10% formalin may be used. The stains employed are carbol-fuchsin and methylene blue.

Sections are freed from paraffin and rehydrated in the ordinary way. If the fixative is one containing mercuric chloride, the slide is covered with Lugol's solution for 10 minutes, washed in water and freed of iodine rapidly in 80% [by volume] alcohol. After further washing in water, the slide is flooded with Ziehl's carbol fuchsin for 10 minutes, flushed with

water and differentiated for a few seconds in 80% alcohol. The preparation is now a bright red colour. It is washed in water, counterstained with 1% aqueous methylene blue for 20 minutes, washed and differentiated in 80% alcohol. The preparations are now a rose-lilac colour according to their thickness. They are dehydrated in the usual way and mounted in balsam.

Nervous tissue appears pale blue or rose according to whether it is grey or white matter. Erythrocytes are carmine, leucocytes deep blue or violet-blue. Neuroglial cells have clear blue cytoplasm, and pale blue nuclei with very deep blue or violet nucleoli.

Negri bodies usually stain clearly in vivid carmine, the depth of colour being related to their compactness. On the other hand, they may be paler (lilac or rose) so that their blue-stained internal corpuscles may be distinguished more clearly. Not infrequently these two types may be seen in a single preparation.

As in the case of Mann's method, cysts of *Encephalitozoon cuniculi* stand out clearly with their ruby colour on a blue field, while *Toxoplasma cuniculi* is a deep blue. *H. J. O'D. Burke-Gaffney*

Reagan, R. L., Yancey, Frances S. & Brueckner, A. L. **Transmission of Rabies from Artificially Infected Bats to Syrian Hamsters.** *Arch. Pathology.* 1957, Mar., v. 63, No. 3, 278–80. [15 refs.]

Although the rabies virus has been isolated from the brain, salivary glands and saliva of experimentally and naturally infected non-haematophagous bats, there is no direct evidence of natural transmission of the virus from such bats to man or lower animals. In order to determine whether in fact non-haematophagous bats could transmit the virus to a susceptible mammalian host by biting, the experiment described in this paper was undertaken.

Of 12 healthy specimens of the cave-dwelling bat *Myotis lucifugus*, 10 were inoculated with 0·1 ml. of a 20% suspension of a street virus strain at its fifth intracerebral passage in mice and 2, which served as controls, with a suspension of normal mouse brain; all 12 were inoculated subcutaneously in the cervical region. All of the 10 inoculated with street virus showed symptoms of rabies in 10–14 days and on the day of appearance of symptoms each bat was allowed to bite one group of 4-day-old suckling hamsters; the several groups of sucklings were then returned to their respective mothers and observed daily for symptoms of rabies

Of the 10 bats infected with rabies 9 had Negri bodies in their brains; saliva from each of 6 and the salivary gland and brain material from each of the 10 produced rabies in mice after intracerebral inoculation.

Of the 26 suckling hamsters bitten by rabid bats, 13 showed symptoms of rabies in 10–14 days. Histological examination, before biological testing, of the brains of these 13 revealed numerous Negri bodies; mice

inoculated intracerebrally with brain suspensions from each of the 13 later developed rabies.

From these results it appears that rabies can be transmitted by the bite of an infected non-haematophagous bat. *G. Stuart*

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

Domaradsky, I. V. & Ivanov, V. A. [**Some Data on the Cultivation of Plague Bacilli on Synthetic Media**] *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii.* Moscow. 1957, v. 28, No. 2, 54–9, 1 fig. [In Russian.]

The authors have investigated the amino-acid requirements of 20 virulent and avirulent strains of plague bacillus. The medium consisted of M/15 *p*H 7·0 phosphate buffer containing 0·05% magnesium sulphate, 0·02% glucose and 17 amino-acids in concentrations of 0·002–0·05%. The organisms were adapted to growth in the medium by successive subcultures, and the minimum dose for inoculation ranged from 20 to 200 organisms with the virulent strains. Experiments with media lacking certain amino-acids showed that all strains except 1 would grow in the absence of aminodicarboxylic, diaminocarboxylic and hydroxyamino-acids, tryptophan, proline, glycine, alanine, valine and *nor*leucine. No growth was obtained in the absence of cystine and methionine, and phenylalanine, serine and threonine were also essential. No change in morphology and biochemical properties was observed after prolonged culture in synthetic medium. *D. J. Bauer*

Bhagavan, N. V., Nimbkar, Y. S. & Rao, S. S. **Fractionation of the Soluble Antigens of** *Pasteurella pestis*. *Indian J. Med. Res.* 1957, Jan., v. 45, No. 1, 1–8. [25 refs.]

A concentrated preparation of virulent *Pasteurella pestis* (195/P strain), obtained by precipitation of a casein hydrolysate culture with ammonium sulphate at full saturation, was dried and extracted successively with ethylene glycol, diethylene glycol and saline, the resulting water-soluble fractions being designated A, B and C respectively. Examination by the agar diffusion precipitin technique showed that each fraction contained a large amount of one antigen and very small amounts of 2 other antigens. Fractions A and B were highly protective for mice, giving a PD50 of 8

and 8·83 per microgram, respectively, while fraction C was inactive. Fractions B and C, but not fraction A, reacted strongly with immune serum for *P. pseudotuberculosis*. The number and intensity of precipitin lines obtained when the fractions were tested with antiserum prepared against an avirulent strain of *P. pestis* were identical with those obtained with antiserum for the virulent strain. *R. S. F. Hennessey*

Wolochow, H., Chatigny, M. & Speck, R. S. **Studies on the Experimental Epidemiology of Respiratory Infections. VII. Apparatus for the Exposure of Monkeys to Infectious Aerosols.** *J. Infect. Dis.* 1957, Jan.–Feb., v. 100, No. 1, 48–57, 3 figs.

This review appears also in the *Bulletin of Hygiene*, 1957, v. 32, July.

This paper describes arrangements for the production of air-borne infection in the monkey by means of an atomizer and continuous flow system similar to that designed by Henderson [see *Bull. Hyg.*, 1952, v. 27, 774]. Monkeys are exposed to infection by inserting the nose in a mask connected with the aerosol circuit. A sampling impinger attached to one side of the mask enables dosage to be controlled. Exposure and handling of infected animals are carried out in a room capable of withstanding treatment with liquid disinfectant and equipped with ultraviolet lamps and a specially designed ventilating system. After exposure, monkeys are kept in cages which are individually ventilated. Operators wear hoods (supplied with air under positive pressure), plastic "coveralls", gloves and boots. Studies of samples showed that predictable doses of organisms could be administered under conditions which produced negligible contamination of the atmosphere in the vicinity of the exposure unit.

The apparatus was tested in many experiments with *Pasteurella pestis*, and also with *Chromobacterium prodigiosum*. *R. S. F. Hennessey*

Speck, R. S. & Wolochow, H. **Studies on the Experimental Epidemiology of Respiratory Infections. VIII. Experimental Pneumonic Plague in** *Macacus rhesus*. *J. Infect. Dis.* 1957, Jan.–Feb., v. 100, No. 1, 58–69, 5 figs. [12 refs.]

The respiratory LD50 of a virulent strain (139L) of *Pasteurella pestis* for *Macacus rhesus* was estimated by exposing unanaesthetized monkeys to various concentrations of organisms in aerosols produced by an atomizer in a continuous flow apparatus with a mask attachment [see above], the inhaled dose being calculated on the basis of exposure time, organism concentration and respiratory volume.

From results with 182 monkeys, an LD50 of $2{\cdot}0 \times 10^4$ inhaled cells was obtained. The average time of death was 6 days after infection,

some animals dying as early as the 4th day and others as late as the 13th day; there was no correlation between dose size and severity of disease with the dose ranges used (from 1·0–3·3 × 10^2 to 1·0–3·3 × 10^6 inhaled organisms). A detailed account is given of clinical and laboratory findings, which closely resembled those reported for pneumonic plague in man. Vaccination with a living avirulent vaccine, a killed virulent vaccine or purified envelope substance (Fraction I) gave no significant protection.

Intramuscular injections of 10 mgm. or over of streptomycin per pound of body weight per day controlled 7 out of 8 infections even when the disease was well developed before treatment was started. With lower dosages (5 mgm. or under per pound), results were variable; signs of disease persisted and often increased, subnormal temperatures and leucopenia being frequently noted in animals whose life was prolonged. Streptomycin-resistant organisms were isolated from the blood of 1 monkey which had received 1·5 mgm. of streptomycin per pound per day for 10 days before death.

R. S. F. Hennessey

Fukui, G. M., Lawton, W. D., Janssen, W. A. & Surgalla, M. J. **Response of Guinea Pig Lungs to *in vivo* and *in vitro* Cultures of *Pasteurella pestis*.** *J. Infect. Dis.* 1957, Jan.–Feb., v. 100, No. 1, 103–7, 2 figs. [11 refs.]

Avirulent or virulent *Pasteurella pestis* grown *in vitro* (casein hydrolysate medium) and introduced into the lungs of guineapigs by aerosol inhalation or intratracheal injection were rapidly cleared during the next 6 hours, viable counts on lung homogenates showing a sharp fall. After this time, avirulent organisms decreased more slowly while virulent organisms increased logarithmically. When preparations of *P. pestis* grown *in vivo* (*e.g.*, in guineapig lungs) were inoculated by intratracheal injection, no initial clearing occurred, viable counts on homogenates increasing 2-fold or more in 6 hours. Organisms grown *in vivo* and administered by aerosol inhalation were cleared in a manner similar to that observed with organisms grown *in vitro*. The early clearance of organisms grown *in vitro* was associated with a high rate of phagocytosis by lung macrophages, while the lack of clearance of organisms grown *in vivo* was accompanied by a low rate of phagocytosis.

R. S. F. Hennessey

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Martini, E. Kritisches zur Hamburger Cholera-Epidemie von 1892. [**Critical Observations on the Cholera Epidemic in Hamburg in 1892**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 182–5.

Tawara, J. **Electron-Microscopic Study on the Flagella of** *Vibrio comma*. *J. Bacteriology*. 1957, Jan., v. 73, No. 1, 89–90, 4 figs.

"A study of the manner of attachment of the flagella on *Vibrio comma* was made. It was found that each flagellum was attached to a granule (blepharoplast) which was embedded in the cytoplasm. The granules ranged in size from 150 to 200 mμ."

Chatterjee, H. N. **Anti-Histamine Drugs in Cholera.** [Correspondence.] *Lancet*. 1957, Mar. 9, 532–3.

To patients suffering in 1954 from cholera and anuria injections were given of either mepyramine maleate (Anthisan), 2 ml. of a 2·5% solution; chlorpromazine hydrochloride (Largactil), 12·5 mgm. or 6 mgm.; or of promethazine hydrochloride (Phenergan), 2 ml. of a 2·5% solution. In the group treated with mepyramine urination failed to commence [in an unspecified time] in 3 of 11 patients, in the chlorpromazine-treated group in 2 of 11 patients, in the promethazine group in 1 of 17 patients, and in a control group in 4 of 16 patients.

Chlorpromazine was found to cause dangerous depression of blood pressure, but no untoward results followed promethazine treatment.

Promethazine and vitamin C were used in combination by the author for the treatment of cholera in 1,610 and 1,178 patients in the years 1955 and 1956, respectively, with mortality rates of 7% and 4·7%. In Calcutta generally, the comparable mortality rates were 32% and 36·5%.

[So many factors affect the mortality rate in cholera, especially nursing care and correction of dehydration, that it is difficult to draw deductions from work in which these factors are not standardized, but the contrast here is admittedly striking.] *A. W. Woodruff*

Lahiri, S. C., Basu, S. N., Lahiri, S. C., Jr. & Ghorai, P. C. **Excretory Function of the Stomach and Treatment of Uraemia in Cholera by Gastric Lavage.** *J. Indian Med. Ass.* 1956, Nov. 16, v. 27, No. 10, 345–51. [12 refs.]

Nitrogen, it is stated, is a known constituent of gastric secretions. The amount present in Indians in health has therefore been studied in

order to assess the application of the observation to the treatment of uraemia, especially that which occurs in cholera.

It was confirmed that nitrogen is found both in the resting gastric juice and in that secreted after the injection of histamine. Its amount is greater in patients suffering from chronic gastric disorders, severe anaemia and in those convalescent from cholera than it is in healthy persons. The average figures in healthy persons for non-protein nitrogen, urea, ammonia and uric acid after histamine stimulation were, respectively, 30·8, 1·4, 5·3 and 1·04 mgm. per 100 ml. Comparable figures for healthy persons, patients convalescing from cholera and others with achlorhydria, hyperchlorhydria and severe anaemia are given in detail.

Gastric lavage with 12 pints of 10% cane sugar solution daily was carried out in 11 patients with uraemia, of whom 9 recovered and 2 died.

[While the authors cannot be said to have made a case for treatment of cholera by gastric lavage their observations are of interest.]

A. W. Woodruff

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Nakamura, M. & Jonsson, S. **The Effect of Antimetabolites on the Growth of** *Endamoeba histolytica*. **I. Purine and Pyrimidine Analogs.** *Arch. Biochemistry.* 1957, Jan., v. 66, No. 1, 183–9. [13 refs.]

Some progress has recently been made in studies of nutritional requirements of *E. histolytica* [this *Bulletin*, 1956, v. 53, 318; 1957, v. 54, 40] by observing the effect of antimetabolites and thus confirming the nature of some growth factors. In the field of chemotherapy the results are of potential importance.

In the present investigation purine and pyrimidine analogues numbering about 30 in all were used in the presence of *E. histolytica* growing on a diphasic medium. Studies on reversal of their effect were made by adding later the purines, adenine, guanine and xanthine as well as the pyrimidines, cytosine, uracil and thymine. The tests were performed in the absence of viable bacteria as previously described by Nakamura [*loc. cit.*] by the use of penicillin G and streptomycin, and inoculations into tubes under examination were made of a fairly constant number of amoebae from a 48-hour culture. In the control tubes the analogues were omitted

during incubation at 37°C. for 3 or 4 days. The mean number of amoebae present at the end of 3 or 4 experiments was determined.

The concentrations of the various analogues which inhibited *E. histolytica* are shown in a table, as well as the effect of the parent purines and pyrimidines on reversal. The inhibition of amoebic growth by analogues which occurred at a concentration of 1 in 750 to 1 in 25,000 was not always reversible.

From the results obtained the authors conclude that purines and pyrimidines are nutrients of *E. histolytica*. Mechanisms other than antimetabolic effect were also at work. The effect of alteration in the chemical constitution of these analogues is discussed. Notably the failure to reverse the inhibitions of 8-azaguanine by adenine, guanine and adenylic acid is recorded. Finally the fact that a number of purine and pyrimidine analogues were amoebicidal is attributed to the fact that they "block nucleic acid metabolism in the amoebae". *J. D. Fulton*

Manson-Bahr, P. & Muggleton, W. J. **Rectal Biopsy as an Aid to the Diagnosis of Amoebic Dysentery and Allied Diseases of the Colon.** *Lancet.* 1957, Apr. 13, 763–5, 7 figs.

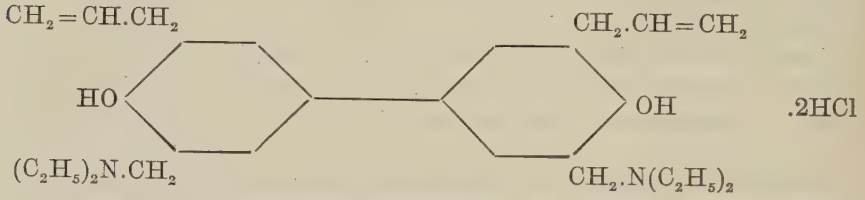
Where patients are not available for prolonged observation any aid to rapid diagnosis is of importance. *Entamoeba histolytica* inhabits the lowermost part of the bowel; this is readily accessible to biopsy through a proctoscope. For this the authors recommend a tubular instrument 6 inches long and 3/5 inch in diameter, illuminated by a "Straight Illuminator Lamp" supplied with current from a battery. It is lubricated with "K-Y Jelly" (not a petroleum jelly). Material for biopsy is taken with a 1/5-inch Volkmann spoon on a 16-inch shaft. A piece of tissue is sliced off by the spoon against the instrument; this is put on a slide and squashed under a coverslip without any diluent fluid; and the preparation is examined microscopically at once. A description, aided by excellent drawings, is given of the appearances of the normal rectal mucosa, of amoebic lesions and the parasites seen in them, of the lesions seen in bacillary dysentery, and of those seen in ulcerative colitis, mucous colitis, and sprue, respectively.

In 30 consecutive cases of amoebic dysentery *E. histolytica* cysts were found in the stools in 16, vegetative forms in 5, and both in 2. No parasites were seen in the stools of the other 7, but from these the proctoscopy technique yielded parasites in all 7; 15 of the 30 yielded parasites by this method; and in 24 a typical red, inflamed, or pitted mucosa was identified. *A. R. D. Adams*

Moretti, G., Benelli, C. & Staeffen, J. Les amoebomes du côlon transverse. [**Amoebomata of the Transverse Colon**] *J. Méd. de Bordeaux.* 1957, Mar., v. 134, No. 3, 386–90. [26 refs.]

Dill, W. A., Fisken, R. A., Reutner, T. F., Weston, J. K. & Glazko, A. J. **Biallylamicol, a new Amebicide. II. Absorption, Distribution in Tissues, and Excretion.** *Antibiotics & Chemotherapy.* New York. 1957, Mar., v. 7, No. 3, 99–112. [15 refs.]

The first report in this series [this *Bulletin*, 1956, v. 53, 191] indicated that biallylamicol, trade name Camoform, of the following constitution



was of value in the treatment of intestinal and hepatic amoebiasis in animals. It is a stable powder soluble in water at *p*H 6 becoming less soluble when this value is raised. It appeared in *A Survey of Antimalarial Drugs 1941–1945* [*ibid.*, 1947, v. 44, 1106] under reference number SN 6771.

Earlier work indicated that the drug was readily absorbed from the intestinal tract and was retained for a long time in the tissues. In carrying out further experiments of this nature the method of Brodie *et al.* [*ibid.*, 1947, v. 44, 793] was used in estimation and consisted essentially in extraction of tissue homogenates containing the drug with ethylene dichloride, followed by treatment with a solution of methyl orange which gives rise to salt formation with the base. The absorption of the extract in ethylene dichloride is read at 535 mμ. Recovery from biological material amounted to 95 to 100%.

The method of estimation was applied to material from rats of approximately 100 gm. weight which were given the drug by mouth or in diet in doses of 50 mgm. base per kgm. body weight. The drug appeared to accumulate in lung, spleen and fat, and to a lesser extent in liver and kidneys while in blood there was minimal retention. Combination with protein occurred to the extent of 40 or 50%. Absorption took place chiefly from the intestine and to a lesser degree from the stomach.

Since dietary fats appeared to retain the drug, the authors suggest that mineral oils in the diet might be of value in treating intestinal amoebic infections. In dogs, fat depots contained more drug than liver and there was no selective deposition in erythrocytes. In tissues the drug was stored largely in unchanged form but chromatographic analysis suggested that small amounts of a metabolite were also present. The drug was excreted partly in bile and small amounts were also excreted in urine and faeces for more than 1 month. During a 2-week period less than 1% of the amount given appeared in urine and 15·5% in faeces. In human patients receiving 25 mgm. per kgm. daily by mouth, relatively low levels of the drug appeared in blood and urine and somewhat more in faeces. Studies in one human patient indicated a distribution of the

drug similar to that in animals and little or no storage occurred in the brain. The low toxicity of the compound and its slow excretion by the channels indicated endow it with considerable advantages as a chemotherapeutic agent. *J. D. Fulton*

Reutner, T. F., Fisken, R. A., Dill, W. A., Glazko, A. J. & Weston, J. K. **Biallylamicol, a New Amebicide. III. Toxicity Studies.** *Antibiotics & Chemotherapy.* New York. 1957, Mar., v. 7, No. 3, 113–31, 2 figs. [16 refs.]

Some data on the subject of toxicity of biallylamicol have already been given by Wiselogle [this *Bulletin*, 1947, v. 44, 1106]. Metabolic studies on the fate of the administered drug were carried out in the present investigations at the same time as toxicity was being determined in rats, mice, hamsters and dogs. Acute and chronic oral toxicity in rodents and oral, intravenous and parenteral tolerance in dogs were determined. Routine examinations of blood and urine, as well as liver and kidney function tests, were carried out before and after drug administration started. Many biopsies were subsequently made on organs and tissues, for histological examination.

In the dog biallylamicol was readily absorbed from the intestine and stored chiefly in liver, spleen, lymphoid tissues and fat and to a lesser extent in kidney, muscle, heart and lung. It did not appear to damage the cells in which it was stored. When administration was stopped in time complete disappearance of drug occurred and the cells remained unharmed. The chief route of excretion is *via* the alimentary canal, in part through the bile. It is also believed that excretion, especially in rodents, takes place partly through the lungs where the drug occurs mainly in macrophages. In rodents the distribution was not essentially different from that in dogs. In man few signs of toxicity have been noted and almost 80 gm. have been given without untoward symptoms over a period of a year, equivalent to over 200 mgm. daily. In mice the LD50 for oral dosage in acute cases was about 3·4 gm. and in rats 1·4 gm. per kgm. Continued dosage to dogs over a period always resulted in anorexia, weight loss, emaciation and death. It was well tolerated intravenously in these animals and caused little irritation at subcutaneous or muscular sites. The storage of drug in the body tissues, for the most part unchanged, without recognizable damage to cells, should increase its safety when used therapeutically.

[Many experimental details are given which cannot be reproduced in an abstract but would repay study.] *J. D. Fulton*

Molina Pasquel, C. & Gutiérrez Ballesteros, E. Tratamiento de la amibiasis intestinal con camoformo. [**Treatment of Intestinal Amoebiasis with Camoform**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1956, June, v. 16, No. 2, 27–31.

The English summary appended to the paper is as follows:—

"Camoform was given by mouth to 18 patients with amoebic colitis. Of these 18 patients, 4 did not come back for control of the disease. Of the 14 that were examined after treatment, 10 showed no cysts in the stools in at least three samples made with intervals of one to three weeks. Of the remaining four cases, three had cysts in the stools immediately after finishing the treatment and considering them as failures were treated with other drugs of known activity. In one case after three months cysts were found in the stools."

Ganatra, R. D., Paralker, N. A. & Lewis, R. A. **Win 5047 in the Treatment of Amebiasis.** *Antibiotic Med.* New York. 1956, Sept., v. 3, No. 4, 253–7.

Win 5047 (Mantomide), bearing the chemical name N-(2,4-dichlorobenzyl)-N-(2-hydroxyethyl) dichloroacetamide, has already been tried as an amoebicide in man [this *Bulletin*, 1954, v. 51, 1065] and reported on favourably. The authors have treated 35 patients suffering from intestinal symptoms of amoebiasis with this drug, in a dosage of 1 gm. twice daily for 10 days; 21 of these appeared to be freed of their infections, and 14 were not, by this treatment. 8 of the latter were re-treated with twice the dose, and 5 of these were subsequently free from parasites. 5 patients with hepatic amoebiasis also were treated with the drug, but apparently without benefit. There were no toxic side effects except in a single patient on the repeated larger dosage; he developed a skin eruption similar to that sometimes following chloramphenicol treatment; both drugs contain the chemical radical $CHCl_2$. *A. R. D. Adams*

Leon, L. A. Posible aplicación del método biológico en la lucha antiamibiana. [**Biological Control of Amoebiasis**] *Medicina.* Mexico. 1956, July 10, v. 36, No. 751, 296–302, 10 figs.

The author describes infections of *Entamoeba histolytica* with the Chytridiaceous fungus *Sphaerita*, which was found by him in Equador in 2% of the patients suffering from amoebiasis. Within the amoebae this parasite occurs singly, in groups, or in the form of a sporangium, whereas its free form in the faeces has the appearance of a yeast. Since *Sphaerita* brings about the destruction of the parasitized amoebae, but appears to be harmless to the human host, it is suggested that it might be used for the biological control of amoebic infections. However, for this method to be practicable it is necessary to study the life-history of this fungus and to cultivate it in large enough numbers. The appearance of parasitized amoebae and their destruction are illustrated by photomicrographs.

C. A. Hoare

Donoso Medina, F. Tratamiento de la Giardiasis con 5-7 dicloro-8-oxiquinaldina (Siosterán). [**Treatment of Giardiasis with 5-7 Dichlor-8-Hydroxy Quinaldine ("Siosteran")**] *Bol. Chileno de Parasit.* 1956, Oct.–Dec., v. 11, No. 4, 69–71.

The English summary appended to the paper is as follows:—

"1) The author reports the therapeutic effect of 5-dichloro-8-oxiquinaldine ('Siosterán') on 74 Giardia-infected children, with ages ranging from 15 months to 13 years.

"2) Three treatment schemes were essayed: a) 0·01 gm/Kg/day for 5 consecutive days; b) 0·02 gm/Kg/day for 5 days; c) 0·02 gm/Kg/day for 10 days. The drug was administered 'per os' after the main meals.

"3) 7 children of 36 treated according to scheme (a) had negative stool examination after treatment; the same was observed in 7 of 29 children treated according to scheme (b), while 3 of nine were negative in the last group. Summing up, 17 children of the total of 74 appeared to be cured after treatment with Siosteran.

"4) No serious toxic side reactions were observed upon administration of the drug.

"5) Siosteran appears to be not an efficient drug in the treatment of *Giardia lamblia* infections."

[See also this *Bulletin*, 1956, v. 53, 1427.]

Webster, B. H. **Human Isosporiasis: a Report of Three cases with Necropsy Findings of One Case.** *Amer. J. Trop. Med. & Hyg.* 1957, Jan., v. 6, No. 1, 86–9. [13 refs.]

"Three cases of isosporiasis in native-born Tennesseans who have never been abroad are reported. Two of the cases recovered spontaneously; the third, a seventy-seven-year-old white woman, expired with signs of electrolyte imbalance. Necropsy findings showed necrosis of the terminal ileum and colon and a sterile peritonitis. The organisms could not be demonstrated in the tissues."

Tempelis, C. H. & Lysenko, M. G. **The Production of Hyaluronidase by** *Balantidium coli*. *Exper. Parasit.* New York. 1957, Jan., v. 6, No. 1, 31–6, 3 figs.

In view of the nature of the lesions produced by *Balantidium coli* it appeared not unlikely that the parasite produced some factor or factors which aided penetration of intestinal mucosa. The production of hyaluronidase has been studied in this investigation. The organism used was obtained from the caecal contents of a pig and maintained in diphasic medium similar to that used for culture of *Entamoeba histolytica*. Culture tubes were conditioned by the addition of a 24-hour growth of

Aerobacter [*Klebsiella*] *aerogenes* before infective material containing *Bal. coli* was added in the presence of penicillin and streptomycin. For detection of hyaluronidase activity due to *Bal. coli*, capsular material from group C streptococci, which contains hyaluronic acid, and also a salt of hyaluronic acid prepared from human umbilical cord, were used as substrates. Balantidia were collected by centrifugation and the culture material was washed to remove bacteria. The protozoa were allowed to act on the group C streptococci and also on bacteria accompanying *Bal. coli*, to serve as control.

Similar experiments were performed with potassium hyaluronate in place of the bacteria. It was observed that in both types of experiment some *Bal. coli* were alive at the end of the experimental period. Experiments in which the mucin clot prevention [MCP] test was used also indicated that *Bal. coli* produced hyaluronidase. It is suggested that once *Bal. coli* has penetrated the intestinal mucosa by mechanical means, hyaluronidase may help in enlargement of the resulting lesion.

[It seems to the abstracter that a less equivocal test than the MCP test should be used in the case of an organism which is supposed to be producing hyaluronidase. The presence of proteolytic enzymes would give the same result. It has, moreover, not been shown that the substance studied possessed enzymic properties or that maximal activity corresponded to a certain *p*H.] *J. D. Fulton*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Weyer, F. & Mooser, H. Beobachtungen an Stämmen von Borrelien im Laboratorium. [**Notes on the Laboratory Strains of** *Borrelia*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 294–304, 2 figs. [12 refs.]

Three Ethiopian strains of *Spirochaeta recurrentis*, one Mexican strain of spirochaetes from *Ornithodorus turicata*, and one Egyptian strain from the small race of *O. erraticus* were transmitted to lice and maintained for several months by louse-to-louse passage. Intra-coelomic inoculation was found to be the simplest method of infecting the lice, and gave better results than intra-rectal inoculation, especially in the number of spirochaetes in the haemocoele. Blood spirochaetes as a rule can easily pass through the wall of the louse alimentary tract, but *S. turicatae* seems to be more difficult to passage in lice than the other strains examined.

The strains of *S. recurrentis* and that from *O. erraticus* also produced natural infections in the bed bug, *Cimex lectularius*, and the spirochaetes in the haemocoele fluid produced infection when inoculated into mice and body lice. Spirochaetes from infected lice were kept in glass ampoules

at −72°C. and retained their virulence for 387 days in the case of a strain of *S. recurrentis*, and 108 days in the strain from *O. erraticus*.

Edward Hindle

Sergent, Ed. De la coexistence, chez le même malade, de la fièvre récurrente et du paludisme. [**The Co-Existence in the Same Host of Relapsing Fever and Malaria**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 242–5. [14 refs.]

The author inoculated 22 adult white rats simultaneously with *Spirochaeta hispanica* and *Plasmodium berghei*, and all of them developed an acute double infection. In 18 cases the two infections were normal, but in 4 rats the double infection was very severe, and one died of the *Plasmodium* infection.

In a second group of 22 rats the spirochaetes were inoculated first, and after the first febrile attack *P. berghei* was inoculated after various intervals ranging from 1 day to 17 weeks. The previous spirochaetal attack was found to have no obvious effect on the course of the *Plasmodium* infection.

A further group of 26 rats were inoculated first with *Plasmodium* and subsequently with spirochaetes, 6 during the primary acute attack of malaria, and the other 20 at various intervals ranging from 1 to 7 weeks after the first attack. None of the 26 rats showed any relapse of malaria following the inoculation of spirochaetes.

The above results show that in the white rat these two infections are not antagonistic, and their coexistence does not appreciably modify their individual virulence.

Edward Hindle

Geigy, R. & Aeschlimann, A. Ratten als Reservoir von *Borrelia duttoni*. [**Rats as Reservoirs of** *Borrelia duttoni*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 96–108, 9 figs. [16 refs.]

The authors made a series of tests to determine the susceptibility of white rats and also of wild rats to infection with *Spirochaeta duttoni* in order to see whether these could act as reservoirs of relapsing fever in Africa. The experiments with white rats confirm previous observations that although these animals can be infected by the injection of either blood from mice containing spirochaetes or suspensions of infected ticks, *Ornithodorus moubata*, the resulting infection is always less severe than in mice. Only newborn rats can be infected by natural transmission through the bite of infected ticks.

Various species of wild rodents have been examined by the authors, including *Praomys jacksoni melanotus* in Tanganyika, *Rattus norvegicus*, *Meriones shawi* and *M. libycus*. None of the wild *Praomys* was found

to be naturally infected, but in the laboratory *P. jacksoni* and *R. norvegicus* could be infected by the injection of blood containing spirochaetes, and *Meriones* with tick suspensions. On the other hand, infection could not be produced by the bites of ticks in either *Rattus* or *Meriones*, not even in newborn *Meriones*. It is concluded, therefore, that wild rats are unlikely to become a natural reservoir of *S. duttoni*. *Edward Hindle*

Geigy, R. & Wagner, O. Ovogenese und Chromosomenverhältnisse bei *Ornithodorus moubata*. [Miscellanea.] [**Ovogenesis and Chromosome Proportions in** *Ornithodorus moubata*] *Acta Tropica*. Basle. 1957, v. 14, No. 1, 88–91, 2 figs.

YAWS AND OTHER TREPONEMATOSES

McFadzean, J. A., McCourt, J. F. & Wilkinson, A. E. **Treponematoses in Gambia, West Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1957, Mar., v. 51, No. 2, 169–81, 1 map & 8 figs. on 2 pls. [19 refs.]

The population of Gambia (1951) was 288,861 of whom 27,297 lived in the colony and the remainder in the Protectorate; there are 5 main tribes and the Protectorate is divided into 4 divisions. In certain selected villages 90% of the population were examined clinically, dark-ground examinations of suspected lesions were made and blood was taken for serum tests (STS) including the Wassermann with crude and cardiolipin antigen, Kahn and Price precipitation tests; in addition TPI tests were done.

In Bathurst, in 49 children with ulcers of the leg STS were negative in 46 and doubtful in 3; TPI were negative in 45, doubtful in 3 and invalid in 1.

Early suspicious lesions showing treponemata were found in 5 of 15 villages; in 1 the diagnosis was yaws and the other 4 it was *siti* (the local name for a form of non-venereal treponematosis).

The clinical features of this last consist of primary or secondary lesions on the mouth, glans penis and skin; late lesions include depigmentation, especially of the hands, contractures of the fingers and occasionally bony lesions; the cardiovascular and central nervous systems are never involved. Transmission is mainly by use of communal drinking and food bowls; flies are considered as possible transmitters.

The incidence of early lesions appears to be under 1% of the population and this is ascribed partly to the widespread use of arsenicals and bismuth. Investigations into the strains of treponemata isolated from patients with

siti suggest that they differ significantly from those from venereal syphilis and have many of the characteristics of those of yaws and other non-venereal treponematoses.

8 figures show very well the various lesions which are commonly seen in *siti*. *T. E. Osmond*

Sardjito, M. & Soebekti, R. **A High Reactive F.P.M. Sero Test easy to carry out even in a Field-Work.** 8 pp. 1956. Jogjakarta: Universitas Gadjah Mada.

Opinions differ as to the treatment of persons in a yaws endemic area, *i.e.*, whether to treat only patients definitely diagnosed, or contacts as well, or all persons. In order to find latent cases some form of serum test is needed. A blood drop filter paper (FP) test has been described [see *Bull. Hyg.*, 1950, v. 25, 693] and the authors tried it. At first it proved unsatisfactory, giving only 3 positives compared with 22 with the VDRL slide flocculation test in 35 sera tested. The Chediak test gave 74 positives compared with 26 with the FP test in 167 tested. When the blood drop was dissolved in 0·1 ml. distilled water the FP test gave 15 positives compared with 47 positives with the VDRL test in yaws patients and 10 compared with 38 in contacts. Evidently this FP test was not sufficiently sensitive.

In further tests the blood drop was dissolved in 3·5% saline; results showed that the FP test gave approximately the same number of positive reactions as the VDRL test in yaws patients, contacts, and healthy persons.

It is suggested that the FP test (as modified) should be tried out on a large scale in a syphilis mass campaign. *T. E. Osmond*

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Davison, A. R. **Infections in Leprosy Institutions.** *Internat. J. Leprosy.* New Orleans. 1956, July–Sept., v. 24, No. 3, 275–9.

Accounts of 6 Europeans and 10 Bantus are given who apparently acquired leprosy in leprosy institutions in S. Africa. There is no record of any of them having had relatives with the disease. The first account is of a doctor in charge of the West Fort Leprosarium who inoculated 10 members of his Bantu staff with leprosy, and probably himself as well

to show that leprosy could not be acquired in that way. Apparently the Bantus did not take the disease, but he developed it in a severe form and died of it.

As the age at which these patients developed the disease is well above the usual age for acquiring it, it is presumed that they contracted it in course of their work. It is contended that even short contact with leprosy may be sufficient to convey it to children. A plea is made that all those working in contact with leprosy patients should take adequate hygienic precautions.

Ernest Muir

MacGregor, H. **Familial Leprosy.** *Leprosy Review.* 1957, Apr., v. 28, No. 2, 66–7.

A Land Dayak suffering from leprosy was admitted to the Settlement at Kuching, Sarawak in 1936. After a year he returned home, but was readmitted as a bad nodular case in 1950. In 1956, out of his family of 10, 6 were found to be suffering from leprosy, but only 1 had positive smears. Those found with the disease were the wife and 5 children ranging from 11 to 20 years of age. Particulars of the cases are given.

Ernest Muir

Gehr, E. **Relapse Cases in Leprosy.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1957, Mar., v. 9, No. 1, 58–68, 12 figs.

Between 1939 and 1949, in Surinam, there was an average of 31 leprosy patients per year in whom the disease was declared arrested, while the average number of deaths was 38. From 1950 to 1955 the numbers with arrested disease were respectively: 31, 47, 46, 125, 240 and 221. From 1954 to 1956 (first quarter), respectively there were 6, 11 and 3 relapses. Of 23 relapses most were in the lepromatous type, and on an average of all relapsing cases the disease had been arrested for 3 years.

Besides the 23 patients with arrested disease which had relapsed, there are described also 3 relapses in cases which once again became quiescent, 12 interrupted cases (relapsed during the quiescent period), and 2 interrupted cases once again quiescent. It is considered that the occasional finding of bacilli does not necessarily indicate relapse, as these bacilli might be dead relics lingering on in the body. Many relapses are mild and of short duration.

To prevent relapses there should be prolonged treatment of arrested cases and periodic examinations at regular intervals. " . . . The lengthening or shortening of periods of observation and quiescence would have little effect on the relapse rate and none on the epidemiological situation."

Cases are described in detail and illustrated with good photographs.

Ernest Muir

Ross, Hilary. **Magnesium Metabolism in Leprosy.** *Internat. J. Leprosy.* New Orleans. 1956, July–Sept., v. 24, No. 3, 280–83.

"Serum magnesium determinations were performed in 177 cases of leprosy, of which 156 were of the lepromatous and 21 of the tuberculoid type. As controls, 27 nonpatients were similarly examined.

"Of the 177 cases, 132 (75·2%) showed magnesium levels within the normal range. Significantly low concentrations were found in 27 lepromatous cases and 1 tuberculoid case which were bacteriologically positive. Of the 28 cases with low levels, 8 had a clinical diagnosis of amyloid nephrosis and one had diabetes. Slightly elevated levels were seen in 16 lepromatous cases and 1 tuberculoid case. Of this latter group, 6 had a clinical diagnosis of amyloid nephrosis.

"Leprosy *per se* does not appear to affect magnesium metabolism. In the series studied, bacteriologically-positive lepromatous cases complicated with amyloid nephrosis tended to show abnormal elevation or depletion of serum magnesium; in 3 of the 14 cases with the tuberculoid condition zero levels were recorded."

Lara, C. B. & Nolasco, J. O. **Self-Healing, or Abortive, and Residual Forms of Childhood Leprosy and their Probable Significance.** *Internat. J. Leprosy.* New Orleans. 1956, July–Sept., v. 24, No. 3, 245–63. [12 refs.]

After reviewing previous work on this subject, the authors give in tabular form the numbers and percentages of 7 different clinical groups, 287 patients being divided according to their initial lesions. The table also divides the patients, according to the subsequent course of the disease, into those with quick healing, late healing, incomplete relapsing and advancing disease. Apparently complete healing occurred in 77·7% of all cases, 12·5% healed incompletely, and in the rest the disease tended to advance. The patients with initial lesions of the papulo-nodular, definitely circumscribed, and thickened forms showed the highest proportions of eventual healing, those with weal-like and raised flat macular lesions an intermediate position, and those with infiltrated diffuse lesions the lowest proportion of healing. It was found that when relapse occurred it was generally within 3 years of apparent healing, relapse becoming gradually more rare in longer periods.

A second table gives the clinical course of the 4 groups with largest lesions in relation to the bacterial findings and lepromin reactivity. The third table shows the average healing time of healed patients, again divided according to the original forms of their lesions.

The last part of the paper deals with the effects of repeated lepromin injections, which appear to have a protective value when given to very young children exposed to infection. "The evidence, however, is inconclusive; a more crucial test would be the exposure to infection of lepromin-tested, Mitsuda-positive children who had been isolated from birth, and

such an observation—necessitated by circumstances—is under way at Culion."

Ernest Muir

MITSUDA, K. **Primary and Secondary Tuberculoid-Leprosy.** *Internat. J. Leprosy.* New Orleans. 1956, July–Sept., v. 24, No. 3, 264–8, 1 fig.

The difference in the reaction of the skin to the leprosy bacillus in tuberculoid as opposed to lepromatous leprosy is determined by the greater degree of resistance in the former. The author believes that it is possible to raise resistance to leprosy in healthy people by injection of lepromin, and he recommends this practice among the staff of the leprosarium.

A report is quoted of 51 lepromatous patients, treated when only chaulmoogra was available, in whom the condition had become quiescent, and in whom the lepromin reaction became positive. Out of 184 lepromatous patients treated at Aisei-en, Japan, 27 changed from negative to positive [this *Bulletin*, 1955, v. 52, 1097], and later out of 700 treated by Saikawa at Aisei-en 190 became positive. Doull is quoted as reporting that in South Africa the test in 38 of 299 patients had changed from negative to positive after 48 weeks' treatment. The author names this state "secondary tuberculoid leprosy" in which the negative lepromin reaction of lepromatous leprosy has become converted to the positive reaction in the arrested case. The positive lepromin reaction should be determined only by the late reading, that is the delayed reaction.

Ernest Muir

CHAUSSINAND, R. Standardisation de la lépromine. [**Standardization of Lepromin**] *Internat. J. Leprosy.* New Orleans. 1956, July–Sept., v. 24, No. 3, 284–91. [13 refs.]

On account of modern treatment of leprosy some fear has been expressed that it may become difficult to obtain sufficient material for preparing the lepromin antigen. To obviate this the author invites workers in charge of anti-leprosy work to send him lepromatous material from which he can prepare a standard antigen according to the Wade modification of the Mitsuda-Hayashi technique, returning them a proportion of the antigen for their use.

Attempts to remove tissue debris from the antigen, because it is sometimes apt to cause false reactions, were made with the use of suprasonic waves. But these attempts were not successful as the waves destroyed too many bacilli.

The author is opposed to diluting the antigen 1 in 750 as suggested by SCHUJMAN and by FLOCH [this *Bulletin*, 1956, v. 53, 1005 *bis*], but considers that a dilution of 1 in 200 may be used for epidemiological work,

though not more than 1 in 60 is advisable for clinics. It is important that an optimal dilution be arrived at for universal adoption. *Ernest Muir*

Floch, H. Utilisation de lépromines diluées (V). Discussions. [**The Use of Diluted Lepromins. (V) Discussion**] *Arch. Inst. Pasteur de la Guyane Française et de l'Inini. Publication No. 406.* 1956, Sept., 6 pp. [14 refs.]

This is a criticism of a paper by Chaussinand *et al.* [this *Bulletin*, 1956, v. 53, 893] in which they describe a lepromin antigen prepared by treating the original whole antigen of Mitsuda-Hayashi-Wade with papain or ultrasonic waves, or with both. The present author refutes the finding of a positive reaction in lepromatous cases, and emphasizes the need for the antigen to contain both bacilli and lepromatous tissue debris. He again emphasizes the finding that a true and efficient reaction is obtained with a high dilution of the entire antigen, which can be used so as to conserve this substance which is becoming more and more difficult to procure.

Ernest Muir

Dubois, A. Quelques observations au sujet du traitement de la lèpre en Europe. [**Some Observations on the Subject of the Treatment of Leprosy in Europe**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 46–53.

24 cases of leprosy had been observed and particulars are given in a table. Of the 24 patients 16 had undergone normal sulphone treatment, the others were treated before sulphone became available or else had been advanced and mutilated cases before treatment began. Of the 16 treated for 2 or more years with sulphones 5 had healed, 5 would probably heal in the future, 2 had improved but had severe neuritis, 3 continued to improve, and 1 had a bacteriological relapse but was now improving on sulphone.

On the whole the author is pleased with the bacteriological improvement, but the neurological results are not so satisfactory. A hope is expressed that research will furnish still better forms of treatment.

Ernest Muir

Davey, T. F., Kissaun, A. M. & Moneta, G. **The Treatment of Leprosy with Diamino-Diphenyl Sulphoxide: a Progress Report.** *Leprosy Review.* 1957, Apr., v. 28, No. 2, 51–9, 4 figs. on 2 pls.

Following on the suggestions of Buu-Hoï [see this *Bulletin*, 1955, v. 52, 163] and Hawking, the authors tested this drug, which is very similar to DDS, on 4 tuberculoid, 1 borderline, 2 indeterminate and 17 lepromatous patients. Of the 24 patients 18 had continuous treatment

with diamino-diphenyl sulphoxide for 12 months or more. Controls on DDS were carefully selected on an individual basis, so that they corresponded with the trial patients not only as regards type of disease but also in subtype, duration and extent of disease.

The results of the 2 groups are shown on two tables. The improvement in bacterial index displayed by the trial patients was a little better than that shown by their controls. It is pointed out, however, that "no matter how accurate the technique of bacteriological examination may be, there remains an element of uncertainty which cannot be overcome". There was erythema nodosum in one case, but not severe enough to interrupt treatment. There was neuritis in 4 cases, but again not sufficient to stop treatment. There were no other definite complications due to the drug, which was given in 100 mgm. tablets, 1 being given 6 days a week, with initial lower doses, and also less for children.

The drug is considered worthy of further trial. *Ernest Muir*

Laviron, P., Lauret, L., Kerbastard, P. & Jardin, C. Le 4,4′-diaminodiphénylsulfoxyde (D.D.S.O.) dans le traitement de la lèpre. [**Diaminodiphenylsulphoxide (DDSO) in the Treatment of Leprosy**] *Bull. Acad. Nat. Méd.* 1957, v. 141, Nos. 9/10, 195–204, 4 figs.

Particulars are given in tabular form of 34 patients treated with this drug, 16 being lepromatous, 2 borderline, 14 tuberculoid and 2 undifferentiated. The standard dosage has been reduced from 200 to 150 mgm. daily for 6 days a week, lower doses being given for the first 2 weeks. Since reducing the dosage lepra reaction has become infrequent, as have other toxic signs. The methods of testing and the concentrations in blood and urine are described. The concentration results are similar to those obtained with a daily dose of 200 mgm. of DDS. The therapeutic activity is comparable in rapidity with that of the sulphones, and lepra reaction is less frequent and less severe than with sulphone treatment. The bacteriostatic effect (as with the sulphones) is better in the lepromatous form than in the forms with fewer bacilli. *Ernest Muir*

Buu-Hoï, N. P., Ba-Khuyen, N. & Dat-Xuong, N. Chimiothérapie antilépreuse au Sud-Vietnam avec les thiocarbanilides seuls ou associés au 4,4′-diaminodiphénylsulfoxyde, et avec une thiosemicarbazone. [**Anti-Leprous Chemotherapy in South Vietnam with the Thiocarbanilides alone or associated with 4,4′-Diaminodiphenylsulphoxide, and with a Thiosemicarbazone**] *Bull. Acad. Nat. Méd.* 1957, v. 141, Nos. 9/10, 204–10.

Three derivatives of thiocarbanilides are mentioned: 4-*n*-butoxy-4′-dimethylaminothiocarbanilide (formula I); 4,4′-diethoxythiocarbanilide (formula II); and 4,4′-diisoamyloxythiocarbanilide (formula III). The

results with formula I were reported by Davey and Currie [see this *Bulletin*, 1956, v. 53, 1435].

Formula II (Dialide) was used by the authors to treat 500 patients with leprosy, 4 out of 5 of whom were suffering from the tuberculoid or undifferentiated form of the disease. In 75% to 80% there was improvement on a daily dose of 0·1 gm. given by mouth, but on the whole the results were inferior to those with diaminodiphenylsulphoxide (DDSO). There was also improvement to a similar extent in 30 patients treated with formula III as with formula II. With a combination of Dialide and DDSO there was considerable activity, as is shown by clinical and bacteriological details of 2 cases. With the "*thiosemicarbazone de la vanillalacétone*", tried in 8 patients, the response was poor as compared with DDSO. *Ernest Muir*

Ramanujam, K. **Chlorpromazine in the "Painful" Complications of Leprosy.** *Leprosy Review.* 1957, Apr., v. 28, No. 2, 60–65.

Chlorpromazine (Largactil) is described as a nervous system depressant and as a "near-relation of the antihistaminic substance". Following on other workers the author tested this drug in 31 leprosy patients in whom the disease was complicated—by neuritis in 21, joint pains in 3, neuritis and joint pains in 2, and generalized body pain in 5.

Largactil was administered orally in 25 mgm. doses 2 or 3 times daily, along with sodium salicylate mixture, to a group of 18 patients. A second group of 9 patients were also given distilled water intravenously, and a third group of 13 were given potassium antimony tartrate intravenously, in addition to Largactil. The 18 patients in the first group were also given Phenergan (promethazine) at bedtime. Of the first group, 7 patients with neuritis, 2 patients with neuritis and joint pains and 3 with generalized body pain obtained complete relief in 4 to 16 days. 3 patients with neuritis and 2 with joint pains which did not yield to Largactil alone were transferred to the third group. This group of 13 in all obtained complete relief with the combined treatment. Of the second group of 9 patients on Largactil and intravenous distilled water 5 obtained complete relief in 5 to 9 days; but the other 4 had to be transferred to the third group, when they obtained complete relief.

Largactil combined with antimony appears to be the best treatment for these painful conditions and it was found suitable for out-patient treatment. *Ernest Muir*

Ridley, D. S. **The Use of Biopsies in Therapeutic Trials in Leprosy.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1957, Mar., v. 51, No. 2, 152–6.

The healing process under sulphones has 2 aspects: absorption of granuloma and contained bacilli in certain areas, and lessened density of bacilli in unresolved areas. The former is more marked generally in

the first year and corresponds with the marked early clinical improvement; the latter predominates at a later stage, and it alone is measured by the bacterial index. To assess improvement, therefore, it is necessary to take into account both the clinical impression of the size of lesions and the bacterial index [see this *Bulletin*, 1956, v. 53, 200]. " Serial biopsies of skin lesions yield information on both aspects of healing, and the numerical index derived from them is therefore broadly equivalent to a combination of the clinical impression of the size of the lesions and their skin-smear index."

The progress of 17 patients on sulphone treatment was observed, biopsies being taken 2 or 3 times within every 6-month period, and the results of biopsy indices are shown in tabular form. " These results imply that in a group under sulphone treatment the disappearance of bacilli is an exponential function, the mean biopsy index being multiplied at regular intervals by a fraction which is constant throughout the period of treatment, irrespective of the severity of the infection." Excluding 3 of the patients who suffered from severe reactions, it was found that the remaining 14 " which were observed long enough to witness a halving of the index (twice over in three of the cases), the mean period [in which the index was halved] was 16 months with individual variations from 10 to 25 months ".

It is suggested that this method of assessing improvement might be used in therapeutic trials of new drugs, so that previously treated patients might be used in smaller numbers and over shorter periods, and yet might give a clear indication of the value of these drugs in leprosy.

Ernest Muir

Convit, J. **Studies of Leprosy in the German Ethnic Group of Colonia Tovar, Venezuela. V. The Morbidity Rates in BCG-Vaccinated and Unvaccinated Groups during Five Years.** *Internat. J. Leprosy.* New Orleans. 1956, July–Sept., v. 24, No. 3, 269–74.

[For previous Reports see *Rev. Sanidad y Asistencia Social.*, 1954, v. 19, 387, 395; *Internat. J. Leprosy*, 1953, v. 21, 587; this *Bulletin*, 1957, v. 54, 48.]

Of two comparable groups of subjects all exposed to leprosy infection, and none at the beginning of the experiment showing signs of leprosy, the one group of 584 were vaccinated with BCG (2 intradermal injections each of 0·1 cc. containing 0·00075 gm. of bacilli), the other group of 522 acting as a control.

After observation, which covered a period of 5 years, 3 subjects have developed leprosy in the BCG-inoculated group, the disease being tuberculoid in all 3; while among the control group 25 have developed leprosy, of which 6 are lepromatous, 8 indeterminate, 8 tuberculoid, and 3 dimorphous. At the beginning of the experiment 94·2% had positive lepromin reactions in the control group and 77·1 in the inoculation group, thus indicating greater resistance in the controls; but at the end of the

period the controls had an average of only 91%, while the inoculated group positives had risen to 95·8%. Also in the controls the prevalent reaction was 1 plus, while in those inoculated the prevalent reaction was 3 plus. The coefficient for the inoculated group with 3 out of 587 persons contracting leprosy is 5·11, while for the controls with 25 out of 547 taking leprosy it is 45·70. "The difference between these coefficients, 40·59, could occur by chance only once in 200,000 similar experiments. . . This means that the reduction of the morbidity coefficient in the vaccinated group can, with all certainty, be attributed to the effect of BCG vaccination." *Ernest Muir*

Hadler, W. A. & Ziti, L. M. **Histological Reactions produced by Experimental Inoculation of** *Mycobacterium leprae murium* **into the Golden Hamster** (*Cricetus auratus*). *Internat. J. Leprosy.* New Orleans. 1956, July–Sept., v. 24, No. 3, 297–306, 14 figs. on 2 pls. [16 refs.]

A group of 20 adult golden hamsters were inoculated intraperitoneally with 0·5 cc. of a suspension of triturated murine leprosy lesions. A similar number of comparable rats were inoculated with the same suspension at the same time, as controls, and for comparison of the lesions. The animals were killed and examined one every 10 and later every 20 days. The maximum survival time for the hamsters was 253 days, and for the rats 280 days.

The progress of the disease in the hamsters was found to have 2 phases. In the early phase the lesions were of a regressive nature, suggesting that the hamster is not initially susceptible to this microorganism. The bacilli are engulfed and destroyed by the macrophages. In the later phase after the 150th day the lesions are progressive and rich in bacilli, and disturb the vital functions of the organism. "In the initial lesions the cells have morphologic and physiologic characters which place them between the epithelioid cell of the guinea-pig on the one hand, and the lepra cell of the rat on the other hand. In the late lesions, however, the cells have only the characters of the rat lepra cell." *Ernest Muir*

Noel, R. & Marie-Suzanne (Soeur). De l'influence de l'injection d'une suspension de *Mycobacterium marianum* autoclavée sur l'évolution de la lèpre murine. Étude histologique. [**The Influence of the Injection of a Suspension of autoclaved** *Myco. marianum* **on the Evolution of Rat Leprosy**] *Bull. Soc. Path. Exot.* 1956, Nov.–Dec., v. 49, No. 6, 1103–8, 3 pls.

8 rats, 3 days old, were inoculated subcutaneously with 0·1 ml. of *Myco. marianum* antigen. This was repeated thrice at monthly intervals. After 5 months' rest 3 similar injections were repeated. After another 2½ months the 5 surviving rats and 6 control rats of a similar age were inoculated intratesticularly with Stefansky bacilli.

The test animals were sacrificed at 1, 3, 4 and 5 months after the inoculation. In the 4- and 5-month-old animals there were small nodules the size of a pea at the site of inoculation. In the control animals after the 4th month there was bilateral ulceration at the sites of inoculation, hypertrophy of the testicles and much enlarged lumbar glands. In the test animals and the controls there was a similar histological picture, but comparatively much less intense and with far fewer bacilli remaining in the test animals.

It is concluded that the effect of *Myco. marianum* was to cause marked prolongation of survival of the rats, and distinct histological attenuation of the lesions.

Ernest Muir

Chang, Y. T. **Chemotherapy of Murine Leprosy. V. The Effects of Various Combinations of 4,4′-Diaminodiphenyl Sulfone (DDS), Streptomycin and Isoniazid on Mouse Leprosy.** *Internat. J. Leprosy.* New Orleans. 1956, July–Sept., v. 24, No. 3, 307–14, 9 figs. on 2 pls. & 1 text fig.

[This is a continuation of previous articles, see this *Bulletin*, 1953, v. 50, 1150, 1151; 1955, v. 52, 655; 1956, v. 53, 329.]

Three experiments are described. In the first 11 groups of mice were used, comprising 220 mice in all. The first group were healthy controls, and the other groups were inoculated intraperitoneally with 0·5 cc. of a suspension of *Myco. leprae-murium*. The second group were untreated leprosy controls; groups 3 and 4 were given DDS, 5 and 6 isoniazid, 7 streptomycin, 8 and 9 streptomycin with isoniazid, and 10 and 11 isoniazid with DDS. In the second experiment the groups were the same, but included also groups treated with combinations of streptomycin and DDS, and of streptomycin, DDS and isoniazid. Experiment 3 repeated experiment 2, omitting the normal mice control group.

Disease progress was measured by the size of the omenta and pelvic fatty pads, thus gauging the comparative effectiveness of the various drugs and their combinations to delay the progress of the lesions. The order of effectiveness of the drugs and their combinations based on various indices was in this order from greater to less: (1) streptomycin, isoniazid and DDS combined, (2) isoniazid and DDS, (3) streptomycin and isoniazid, (4) streptomycin and DDS, (5) streptomycin alone, (6) isoniazid, and (7) DDS.

Ernest Muir

Hirano, N. & Sushida, K. **Chemotherapy of Murine Leprosy. The Effects of Isonicotinoyl-3-Methoxy-4-Hydroxy-Benzal Hydrazone.** *Yokohama Med. Bull.* 1956, Apr., v. 7, No. 2, 57–63, 11 figs. on pl.

In mice infected subcutaneously with *Mycobacterium leprae-murium* isonicotinoyl-3-methoxy-4-hydroxybenzal hydrazone has shown marked activity when given subcutaneously in doses of 0·7 mgm. per mouse per

day or orally in doses of 1·0 mgm. per mouse per day. Established lepromas heal when the treatment is continued for 2–3 months, but if relapses occur the lesions do not then respond to further treatment.

In animals with apparently cured lesions acid-fast bacilli may still be present 130 days after the end of treatment, and although no attempt was made to show whether these organisms were viable, passage into other mice from animals showing no bacilli at the injection site occasionally produced lepromas. *S. R. M. Bushby*

HELMINTHIASIS

Todorović, S. & Popović, D. [**A Contribution to the Knowledge of the Incidence of Intestinal Helminths in Preschool and School Children in Belgrade and Zemun**] *Bull. Inst. Hyg.* Belgrade. 1956, v. 5, No. 4, 85–90. [In Serbian.]

The English summary appended to the paper is as follows:—

"During 1954–1955 in various institutions for children in Belgrade and Zemun there were carried out investigations concerning infestation with intestinal helminths.

"There were found 5 various kinds of helminths i.e.:

"Enterobius vermicularis from 14·2% to 92·1%

"Trichuris trichiura from 4·0% to 61·5%

"Ascaris lumbricoides from 0% to 19·2%

"Hymenolepis nana from 0% to 5·1%

"Taenia saginata and T. solium from 0% to 0·3%

"Such a high percentage of positive findings of intestinal helminths in children asks for the control of helminthiasis according to a plan, for a longer period of time i.e. by raising the hygienic standard of living and by the health education of the population and especially of children."

Diaz-Ungria, C. Nematodes de Venezuela. Especies señaladas hasta la fecha. [**Species of Nematodes Recorded in Venezuela**] *Rev. Sanidad y Asistencia Social.* Caracas. 1956, Sept.–Dec., v. 21, Nos. 5/6, 291–336. [55 refs.]

Lavier, G. Le rôle pathogène des schistosomes. [**Pathogenic Role of Schistosomes**] *Bull. Soc. Path. Exot.* 1956, Nov.–Dec., v. 49, No 6, 1158–67.

Berdonneau, R. & Garcin, D. A propos d'un cas de bilharziose pulmonaire à *Schistosoma mansoni*. [**A Case of Pulmonary Schistosomiasis due to** *S. mansoni*] *Bull. Soc. Path. Exot.* 1956, Nov.–Dec., v. 49, No 6, 1167–72. [24 refs.]

Schick, R., Ritterband, A. B. & Lieberman, A. H. **Fuadin Therapy of Schistosomiasis associated with Ventricular Tachycardia and Death: a Case Report.** *Ann. Intern. Med.* 1957, Feb., v. 46, No. 2, 392–403, 8 figs. [26 refs.]

" A case is reported of ventricular tachycardia and sudden death occuring in a young patient being treated with Fuadin for schistosomiasis. The pharmacology and toxicity of Fuadin are briefly reviewed.

" Fuadin therapy is unquestionably associated with a significant although small mortality.

" In view of these facts, we would urge caution in the administration of Fuadin, with particular attention to signs and symptoms suggesting cardiac toxicity. The question as to whether all patients with schistosomiasis, particularly those in non-epidemic areas, should be treated, might legitimately be raised."

Stirewalt, M. A., with the technical assistance of J. R. Hackey. **Penetration of Host Skin by Cercariae of** *Schistosoma mansoni*. **I. Observed Entry into Skin of Mouse, Hamster, Rat, Monkey and Man.** *J. Parasitology.* 1956, Dec., v. 42, No. 6, 565–80, 7 figs. on pl. [27 refs.]

As mentioned in the title, the penetration of the skin by the cercariae of *S. mansoni* was observed in a number of different hosts, but the most satisfactory results were obtained by using the ear skin of adult " hairless mice " (a special breed maintained in connexion with cancer research) and observing the penetration of cercariae previously stained supravitally with a saturated aqueous solution of purpurin indicator, which stains the preacetabular glands but does not interfere with the power of the cercariae to enter the skin.

The author considers that " The observed cercarial behavior pattern agrees in general in the features discussed with those of other authors, the most recent detailed descriptions being those of Gordon and Griffiths (1951) [this *Bulletin*, 1952, v. 49, 1055] and Standen (1953) [this *Bulletin*, 1954, v. 51, 285]. Differences of detail such as the choice of entry sites, the movement of the tail in penetration, and the persistence of the raised lip around the entry pore are, without doubt, related to characteristics peculiar to different skins, to the individual reactions of cercariae to skin, to techniques employed, such as pre-exposure skin treatment, and especially the number of parasites entering at the same time."

[This paper, in addition to adding further information to our knowledge of the early stages of invasion of schistosome cercariae into the vertebrate host, reviews and brings up to date the information which is available on what is now regarded as a very important aspect of schistosomiasis.]

R. M. Gordon

De Meillon, B. & Paterson, Shirley. **Experimental Bilharziasis in Animals. VI. Effect of Bilharziasis on Growth, Reproduction and Longevity in White Mice.** *South African Med. J.* 1957, Mar. 23, v. 31, No. 12, 281–2, 3 figs.

"Previous papers in this series [this *Bulletin*, 1954, v. 51, 71, 414; 1956, v. 53, 1020, 1443; and *South African Med. J.*, 1957, v. 31, 68] have described the changes in liver and blood pathology, blood biochemistry, and serology following infestation with bilharziasis in animals. The objects of the present study are to determine what may be called the effects of bilharziasis on the biology of the animal. It is easy to demonstrate rather startling lesions in the liver and to show impairment of its function as a result of bilharziasis, but how is the normal function, performance and behaviour of the animal as a biological unit affected? This is what we have tried to assess by using as yardsticks growth, fertility, reproduction, ability to rear young and longevity."

The authors' summary of the results of the experiments described in the present article, which were carried out with colonies of white mice infected with an Egyptian strain of *Schistosoma mansoni* maintained in *Australorbis glabratus*, is as follows:—

"Experiments with colonies of white mice infected with an Egyptian strain of *S. mansoni* maintained in *A. glabratus* have shown that:

"1. Weight increment and weaning rate decrease and mortality increases as the infecting dose increases.

"2. Litter size, weight at birth and weight at weaning are unaffected by bilharziasis in the parent mice.

"3. A light initial infection provides protection against a subsequent heavier one.

"4. In the light of the work reported, admittedly in animals only, the advisability of administering chemotherapeutic drugs to populations constantly at risk merits investigation."

[This important paper, describing the results of a large number of carefully controlled experiments carried out with an adequate number of laboratory animals should be read in conjunction with those previously published in this series.] *R. M. Gordon*

Evans, A. S. & Stirewalt, M. A. **Serologic Reactions in *Schistosoma mansoni* Infections. III. Ionographic Fractionation of Sera of Mice with Progressive Disease.** *Exper. Parasit.* New York. 1957, Jan., v. 6, No. 1, 8–17, 3 figs.

"Sera of mice with progressive *Schistosoma mansoni* infection were fractionated in a semi-closed, horizontal bridge filter paper electrophoresis system. In the early disease, before deposition of eggs in the liver and migration of the worms to the mesenteric vessels, no notable changes in the serum protein fractions were observed. However, with progressive

disease, an increase in total proteins was found referable by ionographic determination directly to an absolute increase in the gamma-beta globulin regions. There was a relative decrease in albumin, but the absolute concentration of this component remained constant within biological limits. The previously reported disappearance of the alpha-1-fraction in old schistosome infections appeared to be, at least in part, gerontic."

[See this *Bulletin*, 1956, v. 53, 614.]

Hendricks, J. R. & Cort, W. W. **A Study of the *in vitro* Actions of Antiserums on the Cercariae of Certain Bird Schistosomes.** *J. Parasitology.* 1956, Dec., v. 42, No. 6, 557–64, 4 figs. on pl.

The authors discuss a limited number of the more important papers concerned with certain agglutination and precipitin phenomena which have been observed to follow the immersion of schistosome larvae in homologous antisera [this *Bulletin*, 1949, v. 46, 55, 1154; 1950, v. 47, 635; 1955, v. 52, 993].

Following this brief review they describe their own observations on the cercariae of certain bird schistosomes when immersed in the sera collected from birds and animals previously exposed to infection. The cercariae used for infecting and for testing were obtained from naturally infected snails collected in the Douglas Lake region of Northern Michigan. "The cercariae of *Trichobilharzia elvae* (Miller, 1923) from *Lymnea stagnalis*, those of *T. stagnicolae* (Talbot, 1936) from *Stagnicola emarginata*, and those of *T. physellae* (Talbot, 1936) from *Physa parkeri*. They were used within 12 hours after being shed." With the appropriate controls, "a total of 40 tests was made with each of the 3 species of cercariae in homologous antiserum from both rabbits and ducklings and in the 2 heterologous antiserums from both host animals".

The authors' summary is as follows.

"The *in vitro* activity of cercariae of *Trichobilharzia elvae*, *T. physellae*, and *T. stagnicolae* was observed in serums of rabbits [one rabbit exposed to *T. elvae*, one to *T. physellae* and one to *T. stagnicolae*] and ducklings [one duckling which passed eggs of *T. elvae* after 19 days, one which passed eggs of *T. physellae* after 38 days, and 6 which although previously exposed to the cercariae of *T. stagnicolae* gave no evidence of adult infection] with homologous and heterologous infections, and compared with the effects of serums from the uninfected host species. Inactivated (56°C for 30 minutes) serums from the uninfected hosts produced no detrimental effect on the cercariae in 24 hours at room temperature. Low dilutions of rabbit antiserum caused a characteristic pericercarial envelope formation (CHR). In more dilute rabbit antiserum and low dilutions of duckling antiserum only a partial envelope formed and a mucoid secretion appeared at the anterior end. In higher dilutions of the antiserums of both hosts, the cercariae did not form recognizable

envelopes but did secrete large amounts of material from the oral openings.

"It is suggested that the phenomena of envelope-formation and agglutination arise from different reacting principles. In strong antiserum, the envelope forms immediately and, as has been pointed out by others, seems to have its origin in the fine extra-cuticular material present on the cercariae. In weaker antiserums, the envelope does not form over the anterior end of the cercariae. In these the oral secretion, which appears to be sticky, seems to be responsible for the tendency of the cercariae to adhere to the slide and to one another. In the weakest of the reacting antiserums, no envelope is seen to form but profuse oral secretion occurs and becomes dispersed in the surrounding medium. This is apparently responsible for the firm agglutination of the cercariae." *R. M. Gordon*

Ito, J. **Studies on the Brackish Water Cercariae in Japan. I. Two New Furcocercous Cercariae,** *Cercaria ogatai* **n. sp., and** *Cercaria tympanotoni* **n. sp. in Tokyo Bay (Trematoda).** *Japanese J. Med. Sci. & Biol.* 1956, Oct., v. 9, Nos. 4/5, 223–34, 11 figs. [27 refs.]

———. **Studies on the Brackish Water Cercariae in Japan. II. Two New Long-Tailed Cercariae,** *Cercaria komiyai* **n. sp. and** *Cercaria nigrocaudata* **n. sp. in Tokyo Bay (Trematoda).** *Japanese J. Med. Sci. & Biol.* 1956, Oct., v. 9, Nos. 4/5, 235–42, 13 figs.

Murakami, K. [**Studies on** *Clonorchis sinensis.* **Surveys on the Infection of Encysted Larvae of** *Clonorchis sinensis* **in Fresh-Water Fish (***Pseudorasbora parva***) in Tokushima Prefecture.** *Shikoku Acta Med.* 1957, Jan., v. 10, No. 1, 11–31, 13 text figs. & 25 figs. on 2 pls. [75 refs.] [In Japanese.] English summary.

Between August 1954 and November 1956 the authors made an extensive search in Tokushima Prefecture, Shikoku Island, Japan, for larvae of *Clonorchis sinensis* in the freshwater fish *Pseudorasbora parva*, which is believed to be the most important second intermediate host of the worm.

In one series of 1,801 fish caught in 7 districts north of the Yoshino river, the incidence of infection varied between 2% and 93·3%. The highest incidences were in Ohtsu-cho, Kitajima-cho (70·7%) and Horie-cho (50·3%). 70 of these fish caught along the Katsuura river were negative.

In 538 *P. parva* caught in areas south of the Naka river, the highest incidence (81·9%) was in 290 fish from Tomioka-cho. No *P. parva* were found along the Kaifu river, but the environmental conditions are different there, there are few freshwater fish and *C. sinensis* is probably absent from the 2 districts studied there.

Metacercariae of 12 other species of flukes were also found in the various specimens of *P. parva*.

Hardly any studies on the incidence of *C. sinensis* have been made in Shikoku up till now, but the present studies suggest that Tokushima Prefecture ranks among the most heavily infested regions in Japan.

H. J. O'D. Burke-Gaffney

Shigemi, M. [**Studies on the Lung-Fluke** *Paragonimus westermanii* **(Kerbert, 1878). Part 1. Distribution of** *P. westermanii* **in the Eastern Part of Kyushu. Part 2. Embolism caused by the Egg of** *P. westermanii* **in its Final Host, particularly the Differences between the Egg-Caused Embolism due to this Fluke and that due to** *P. ohirai* **Miyazaki, 1939**] *Igaku Kenkyu.* Fukuoka. 1957, Jan., v. 27, No. 1, 153–72, 10 figs. on 2 pls. & 1 map. [69 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

Part 1. " The manner the lung-fluke was found parasitic in the crab living in the main rivers in Oita-ken, Miyazaki-ken, and the eastern part of Fukuoka-ken was as follows.

" 1) The *Eriocheir japonicus* was found living in all 24 rivers examined for them, and 8323 metacercariae were found parasitic in 871 (34·5%) of 2524 crabs of this species collected.

" 2) The average number of the larvae found in one crab ranged from 8·9 for the crabs from the Haraigo River to 2·6 for those from the Iwamaru River, in Fukuoka-ken, from 11·8 for those from the Ono River to 4·5 for those from the Oita River, in Oita-ken, and from 27·0 for those from the Oyodo River to 1 for those from the Kita River and the Gokase River, in Miyazaki-ken.

" 3) The males and the females of these crabs had each approximately the same number of larval flukes parasitic in them.

" 4) A crab with a carapace 4 to 5 cm across had a greater number of the larvae in it than one with a carapace larger or smaller.

" 5) The body areas of the crab where the metacercaria was found were the muscle in 26·1% and the liver in 2·4%.

" 6) The largest number of metacercariae that were found in one crab caught in each of the three prefectures was 357.

Part 2. " Experimental parasitism with *P. westermanii* was produced in 10 cats and that with *P. ohirai* in 2 cats and a weasel *Mustela sibirica itatsi*, and the frequency of occurrence of embolism due to the eggs of the two different kinds of flukes and the lesions they each caused were studied and compared in the two different hosts, with the following results.

" 1) In 10 cats infected with *P. westermanii*: Three of them had 6 eggs in total in their cerebrum, 2 had 2 in their cerebellum, 2 had 3 in their heart, and none had any in the liver, kidney, adrenal, spleen, or pancreas.

" 2) In 2 cats infected with *P. ohirai*: Both had embolism caused in

them; the two had 41 eggs in total in the cerebrum, 11 in the cerebellum, 11 in the heart, 4 in the liver, 21 in the kidneys, and 3 in the spleen.

" 3) Egg-caused embolism was thus higher in incidence in cats infected with *P. ohirai* than in those infected with *P. westermanii*, though the lesions produced were not essentially varied in severity in these two groups of cats.

" 4) Egg-caused embolism was higher in incidence in the weasel infected with *P. ohirai* than in cats infected with the same fluke, but the lesions produced were practically the same in the two different animals.

" 5) The weasel became readily infected with *P. ohirai*, but with no small difficulty with *P. westermanii*.

" 6) The cysts formed by either of the different species of lung-flukes were found in a greater number in the right than in the left lung and in the diaphragmatic than in any other lobe of the lung, right and left.

" 7) The number of adult forms found in one cyst, ranging from 1 to 5 in different cases, was 2 in the great majority (91·5%) of cases.

" 8) The lesion due to the presence of the body of the fluke did not much depend for its severity upon the particular species producing it."

Michon, P., Heully, F., Dornier, R., Larcan, A., Huriet, C. & Peters, A. Distomatoses hépatiques à *Fasciola hepatica* contractées dans le Nord-Est de la France. [*Fasciola hepatica* **Infection Contracted in North-East France**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris*. 1957, Nos. 9/10, 215–20. [32 refs.]

A report of 2 cases.

Rohrbacher, G. H., Jr. **Observations on the Survival** *in vitro* **of Bacteria-Free Adult Common Liver Flukes,** *Fasciola hepatica* **Linn., 1758.** *J. Parasitology*. 1957, Feb., v. 43, No. 1, 9–18. [12 refs.]

" 1. Data are presented showing the aerobic maintenance *in vitro* of bacteria-free adult *F. hepatica*. Autoclaved liver extract at the rate of 200 ml to 800 ml of basic saline solution plus 10 ml Injection Crude Liver maintained some flukes in excellent condition for 3 weeks and permitted survival for 30 days.

" 2. Variation in pH within the range of 7 to 8·5 and considerable variation of inorganic constituents of the basic saline solution did not affect the survival of the parasite *in vitro*.

" 3. Data are presented which confirm Stephenson's (1947) demonstration that *F. hepatica* can apparently absorb simple carbohydrates through its cuticle.

" 4. *F. hepatica* can survive in solutions of glucose, fructose and glycerol, and to a lesser extent in cholesterol, pyruvate and glutamic acid. The fluke cannot survive in solutions containing galactose, sucrose, maltose, ribose or sorbitol.

"5. Data are presented which show that *F. hepatica* can survive as long in anaerobic solutions as in aerobic solutions, but that the motility, color and shape indicate that this parasite is primarily an aerobic organism. Arguments are presented to support the hypothesis that *in vivo*, *F. hepatica* lives primarily as an aerobe."

SINGH, A. & JOLLY, S. S. **Cysticercosis. Case Report.** *Indian J. Med. Sci.* 1957, Feb., v. 11, No. 2, 98–101, 2 figs. on pl.

"1. Literature of cerebral cysticercosis is briefly reviewed.

"2. Attention is drawn to certain common but unfamiliar neurological manifestations of cerebral cysticercosis.

"3. An unusual case of cysticercosis is described in which besides the cerebral manifestations, a peculiar symmetrical muscular hypertrophy and progressive blindness were the presenting symptoms."

MCKINNON, J. A. **The Mass Treatment of Tapeworm with Mepacrine.** *East African Med. J.* 1957, Jan., v. 34, No. 1, 15–18.

The author found that 494 adult male Africans out of a total of 1,120 in a works camp in Kenya were infected with tapeworm. [It can be assumed that the infection was solely due to *Taenia saginata*.] These 494 men were treated with mepacrine according to the following scheme of oral administration:

(i) magnesium sulphate 480 grains (31·1 gm.) on an empty stomach;
(ii) mepacrine 800 mgm. in 4 equally divided doses at 5-minute intervals with sips of an antacid mixture to reduce nausea;
(iii) 1 hour later, magnesium sulphate 960 grains (62·2 gm.).

On the 4th day after treatment 112 were still passing segments or ova but by the time these patients were recalled for re-treatment the number still showing evidence of *Taenia* was reduced to 61. The second treatment reduced this number to 8.

Re-examination 3 months later was possible in 200 of those treated and showed 18 (9%) still to be passing segments or ova. 170 of these had had one treatment and showed 16 (9·4%) failures, 30 had had two treatments with 2 (6·7%) failures.

No adverse effects were seen except vomiting of mepacrine which occurred in 12 patients, 8 of whom required re-treatment.

The author emphasizes that all the subjects were adult well-nourished males in apparent good health. No attempts were made to identify scolices.

[The author concludes that mepacrine is a suitable treatment under these conditions but goes too far in suggesting that mass treatment would reduce tapeworm infestation in a community to negligible proportions. Re-infection must be prevented. A similar experiment with the use of dichlorophen would be instructive.] *Frederick J. Wright*

Rausch, R. & Schiller, E. L. **Studies on the Helminth Fauna of Alaska. XXV. The Ecology and Public Health Significance of *Echinococcus sibiricensis* Rausch & Schiller, 1954, on St. Lawrence Island.** *Parasitology.* 1956, Nov., v. 46, Nos. 3/4, 395–419, 16 figs. (13 on 2 pls.). [23 refs.]

In 1950 the authors found a new species of *Echinococcus* which they have named *E. sibiricensis* Rausch & Schiller, 1954. They regard this as the cause of alveolar hydatid disease in man.

In this paper they state their belief that the cestode, which has a wide distribution from south-central Europe eastwards across European Russia and Siberia, and which occurs in high incidence in the arctic fox, *Alopex lagopus*, on St. Lawrence Island, situated in the Bering Sea between Alaska and Siberia, was probably brought to the island from Asia by foxes carried by the pack ice. Dogs are also suitable final hosts. Although on St. Lawrence Island only a relatively low incidence has been observed in dogs as compared with that in foxes (probably because the former are restrained and have little opportunity to capture and eat microtine rodents which are the important intermediate hosts), nevertheless the authors estimate conservatively that there is on the average one infected dog per sledge team.

The tundra vole, *Microtus oeconomus*, was found to be the only species of rodent which had any importance on the island. In naturally infected tundra vole rather light primary infections were frequent, but heavily infected animals sometimes showed a remarkable degree of generalized infection following metastasis of larval tissue elements. Primary foci are known to occur only in the liver, but secondary foci were most often localized in the mesentery and they were also frequently found in the spleen, ligaments of the uterus and bladder, and in subcutaneous sites. Pulmonary lesions were not observed.

The larval stage of *E. sibiricensis* can also develop satisfactorily in the red-backed vole, *Clethrionomys rutilus*, which occurs on the island in small numbers. Feeding experiments were conducted on several microtine, sciurid and other rodents and on some other mammals. These experimental animals included certain species which do not occur on St. Lawrence Island but which represent part of the fauna of the continent of North America which is at present free from *E. sibiricensis*. Reference should be made to the original paper for details. Some exotic species of rodent, notably the common field vole, *M. pennsylvanicus*, and the brown lemming, *Lemmus sibiricus*, both common in North America, proved to be suitable hosts; other mammals, including several species of rodents, a horse, 2 goats and 5 pigs, were not suitable. In unsuitable animals, however, there was sometimes evidence of the migration of larvae to the host's liver but severe tissue reactions prevented the successful development of larvae and the infections were overcome. Man is not a favourable host but the larval cestode does become established in some persons and may persist and cause morbidity or even death.

There is evidence that in the rhesus monkey the pattern of infection resembles that which obtains in man.

Brief reference is made to experimental work with *E. granulosus* (Batsch, 1786). The authors state that mammals of nearly all species considered in their paper have been exposed to this infection, but results in all rodents thus exposed have been negative.

In a section dealing with alveolar hydatid disease in man the authors report the condition for the first time in the Eskimo of St. Lawrence Island. Case histories of 2 patients who were treated surgically are provided to support the authors' conclusion that the disease they have observed is identical with that in Eurasia. The results of Casoni tests with a non-specific antigen (dried strobilae of *Dipylidium caninum*) are given. 56 out of 232 persons of 12 years of age or older reacted positively. In another series of tests on Eskimos ranging in age from 8 to more than 70 years the results are compared of (i) a Casoni test with alveolar antigen from larval tissue of red-backed voles infected experimentally with *E. sibiricensis*; (ii) a Casoni test with cystic antigen from the fluid of *E. granulosus* cysts from man; and (iii) complement-fixation tests. Of 233 persons tested, 78 reacted positively to the Casoni test (alveolar antigen), 37 to the Casoni test (cystic antigen), and 35 to the complement-fixation test. The following information relative to these tests is quoted verbatim. "In comparing results of the Casoni and complement-fixation tests, it was found that twenty-six of the thirty-five persons for whom the complement-fixation test was positive also gave a positive Casoni reaction using the alveolar-type antigen. Only seventeen positive Casoni tests for the same thirty-five persons were obtained with the cyst fluid antigen. The Casoni test was negative with both antigens in nine of the thirty-five persons for whom the complement fixation was positive. A positive Casoni reaction (using the alveolar antigen) was obtained for fifty-two persons for whom the complement-fixation test gave negative or doubtful results."

The authors point out, however, that a positive Casoni reaction with a negative complement-fixation test may indicate an infection which has been overcome by the tissue reaction of the host. In the conclusions at the end of the paper it is pointed out that there is evidence that in man the larvae are in many cases overcome by the tissue response which they elicit. Recent opinions of other authors on the value of diagnostic tests for hydatid disease are discussed and should be consulted by those interested in the subject.

The resistance of the eggs of *E. sibiricensis* is of epidemiological significance. Experimentally some eggs have remained infective for intermediate hosts after having been frozen at −26°C. in a mixture of water and intestinal content of foxes for 60 days. Moreover, temperatures as low as −56°C. did not kill all eggs. In frozen fox carcasses the eggs have been found to survive for long periods. Thus there may be serious hazards for those engaged in the fox-trapping industry, a basic economic

enterprise of the Eskimo, since eggs may be shaken off carcasses and scattered about when the foxes are brought back to the villages for thawing and skinning, procedures that are at present carried out in the homes. To reduce the risk to families it is recommended that special buildings be erected for the conduct of thawing and skinning operations.

Dogs are also important disseminators of the eggs of *E. sibiricensis*. As has been stated it is estimated that there is on the average one infected dog per sledge team. The restraint of dogs, which should be chained on areas free from vegetation and at a reasonable distance from the human dwellings, is recommended, and the eradication of voles from the neighbourhood of the houses is advised. Although the routine treatment of dogs with an anthelmintic might be expected to effect a significant reduction in the number of cestodes in infected dogs, the authors are doubtful about the efficacy of anthelmintic treatment since the tapeworms are deeply embedded in the mucosa of the small intestine.

The importance of preventing the spread of *E. sibiricensis* to the North American continent is emphasized and regulations prohibiting the movement of dogs from St. Lawrence Island to the Alaskan mainland have been made. *R. B. Griffiths*

Di Bello, R. Contribución al estudio del quiste hidático del ventrículo izquierdo. Trabajo basado en 94 observaciones de la literatura mundial. [**Contribution to the Study of Left Ventricle Hydatid Cyst**] *An. Facul. de Med. Montevideo.* 1956, Nov.–Dec., v. 41, No. 6, 235–50. [112 refs.] English summary.

López Rico, A., Loyo Díaz, Celia & Retaloza Díaz, Teresa. Tetracloretileno sin purgante en la terapéutica antihelmíntica (estudio de 534 casos). [**Treatment of 534 Cases of Hookworm Disease with Tetrachlorethylene without Purgative**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1956, Sept., v. 16, No. 3, 59–63, 1 graph.

The English summary appended to the paper is as follows:—

"The results of the treatment of 534 cases of hookworm using exclusively tetraclorethylene without purgative, are presented. The drug was effective in this way in slightly over 90% of the cases, when the treatment was repeated three times without objectionable reactions for the patients."

Ito, J. & Inaizumi, T. **The *in vitro* Action of a Human Serum on the Infective Larvae of *Trichostrongylus orientalis*.** *Acta Med. et Biologica.* Niigata. 1956, Dec., v. 4, No. 3, 265–9, 3 figs. [11 refs.]

"This evidence of the in vitro action of a patient's serum on the infective larvae of *T. orientalis* is of special interest because of the

adhesive precipitates formed on the sheathes over the oral, excretory, and anal pores. Apparently we have here a typical precipitin reaction in which some metabolic, or perhaps some excretory product of the larvae acts as an antigen.

"In the present in vitro experiments the formation of precipitates appears responsible for the subsequent inhibition of the activity of the infective larvae. The parasiticidal effect of such serum suggests that the antibody involved plays some role in this nematodes defence process.

"No changes were observed on the larvae placed in the serum of the same patient, taken out again about one month later. This suggests that the phenomenon is a transient reaction occurring at a certain stage of the nematode infection."

Biagi F., F. & Portilla, J. Hallazgo de huevecillos de Heteroderidae en heces humanas. [*Heterodera* **Eggs in Human Faeces**] *Medicina.* Mexico. 1957, Jan. 25, v. 37, No. 764, 25–7, 1 fig.

The authors found eggs of *Heterodera* sp. on two occasions each in the stools of 2 children in Mexico City. On one occasion, a larva was also found. The measurements are given and the specimens are well shown in several photomicrographs. The differential diagnosis of such an accidental finding is stressed. *H. J. O'D. Burke-Gaffney*

Ehrenford, F. A. **Canine Ascariasis as a Potential Source of Visceral Larva Migrans.** *Amer. J. Trop. Med. & Hyg.* 1957, Jan., v. 6, No. 1, 166–70, 1 fig. [17 refs.]

"A high incidence of infection with *T. canis* was found in dogs aged 3–6 months. In mature dogs a marked difference in resistance is found between the sexes. Males exhibit little resistance to *T. canis* as compared to females, whose resistance increases up to the age of 3 years. A pronounced variation in seasonal incidence of *T. canis* was found in male dogs; the incidence was highest during winter and lowest during summer months. Female dogs showed a fairly uniform seasonal incidence. Evidence is provided in this study to show that in the Midwestern area of the United States *Toxocara canis* is a common parasite of dogs."

Yoeli, M. **The Problem of Filariasis among Indian Jews in Israel.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1957, Mar., v 51, No. 2, 125–31, 1 map.

The author reports the results of an investigation designed to ascertain the extent to which *Wuchereria bancrofti*, imported into Israel by Indian

Jewish immigrants, was persisting, and to assess the danger of spread. No evidence was obtained of a new infection having been acquired in Israel, but of 878 Indian Jewish immigrants examined 102 (11·6%) were found to exhibit *W. bancrofti* microfilariae in blood slides taken at night. It was further found that a small number of *Culex molestus* caught in houses of these settlers were infected with *W. bancrofti*. In 3 experiments with laboratory-bred local *C. molestus* fed on carriers of *W. bancrofti* microfilariae, infection rates of 65%, 86·9% and 82·3% respectively were obtained.

The author notes that 7 autochthonous cases of filariasis have been reported from the Lebanon [Brounst and Naffah, this *Bulletin*, 1953, v. 50, 831], but concludes that under the prevailing conditions of settlement in Israel the chances of spread of filariasis are small, and presumes that combined chemotherapy and antimosquito measures will be successful in existing foci.

[See also *ibid.*, 1956, v. 53, 1458.] *Frederick J. Wright*

Dissanaike, A. S., Dissanaike, G. A. & Niles, W. J. **Production of Radioactive Infective Larvae of** *Wuchereria bancrofti* **in** *Culex fatigans*. *Exper. Parasit.* New York. 1957, Jan., v. 6, No. 1, 52–9.

Radio-active strontium (^{89}Sr) at 0·05 μc. per ml. of larval breeding media gave a high mortality with *Culex fatigans* [*C. pipiens fatigans*] and the few adults obtained failed to take a blood meal. Satisfactorily radio-active adults were, however, obtained from larval media containing 0·025 and 0·1 μc. per ml. of radio-active phosphorus (^{32}P). At concentrations of 1·0 μc. per ml., emergence was delayed and the adults failed to feed.

Radio-active adults were fed on patients with 114 and 125 microfilariae of *Wuchereria bancrofti* per 20 cmm. of blood. 12 days later infective larvae were dissected from mosquitoes, which were still highly radio-active, and the larvae, after repeated washing in distilled water, were dried and found to be emitting β-particles, registering up to 22 counts per minute.

Control observations show that the radio-activity was from the filarial larvae and not due to superficial contamination. Although it has thus been possible to tag the infective larvae with ^{32}P, the follow-up of larvae in the mammalian host would probably require the use of a more penetrating radiation lasting a considerable time. Radio-active sodium (^{22}Na) is suggested as it emits gamma rays and its half-life is about 3 years. If larvae can be tagged in this way investigations in vertebrate hosts of worm development and distribution in cerebrospinal nematodiasis besides filariasis may be envisaged. *D. S. Bertram*

Hoeppli, R. **Early Tahitian Views on Elephantiasis.** *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 161–8. [25 refs.]

Thooris, G. C., Heuls, J., Kessel, J. F., L'Hoiry, & Bambridge, B. Étude sur les méthodes de diagnostic et de traitement de la filariose à *Wuchereria bancrofti* en Océanie française. [**Study of Methods of Diagnosis and Treatment of** *W. bancrofti* **Infections in French Oceania**] *Bull. Soc. Path. Exot.* 1956, Nov.–Dec., v. 49, No. 6, 1138–57, 1 chart. [12 refs.]

In Tahiti, before the antifilarial campaign was instituted, 22% of the inhabitants gave a history of lymphangitis. The mean number of attacks per person per annum was 0·82. 6·9% of the population suffered from elephantiasis, 9·8% of males had hydroceles and no less than 41% bore some signs of chronic filarial disease, but the number of carriers of microfilariae in these cases was less than for the population in general. *Per contra*, 15% of microfilaria carriers presented no other evidence of filarial disease. When the intradermal tests were introduced it was found that the great majority of filariasis patients gave a positive reaction, but there remained a residue of 10% who gave a negative skin test. The reaction is not affected by diethylcarbamazine treatment. In Tahiti where *Dirofilaria immitis* may occur in dogs, it is quite possible that the indigenous people are sensitized against this parasite, so that the interpretation of the reaction becomes difficult.

In the search for adult filariae the authors examined 86 specimens recovered from 83 patients with filariasis. The tissues were immersed immediately in normal saline and left for 12 hours; sometimes they were digested with artificial gastric juice. From 86 specimens 20 adult filariae were recovered: 14 from epitrochlear or inguinal glands (out of 48); 4 from the scrotum (22 examined); one each in mesentery and omentum at autopsy, but none from any other sources.

In order to study the action of diethylcarbamazine on the adult stage, 8 glands and 2 scrota were examined after a course of treatment, but no live worms were found.

A critical comparison was made of methods of demonstrating microfilariae in the blood—Knott's technique and the "thick drop". On the whole there was little to choose between the two methods and so for the purposes of this research the well-tried thick drop was used as a routine as being more simple and more rapid.

The first results of prophylactic treatment with diethylcarbamazine were evaluated by this method. In a series of 145 microfilaria carriers treated by Kessel *et al.* [this *Bulletin*, 1954, v. 51, 503] this drug was administered in a dose of 2 mgm. per kgm. three times daily for 7 days. The percentage positive fell to 40 after one year and to 17·5 a similar period after a second treatment. In 1,385 persons of the general population, of whom 39% were infected, 21% were still positive after the

first and 19% after the second course of this antifilarial treatment. It became apparent that the percentage of carriers was reduced by about half after each course of treatment, but that further decrease became more difficult: this result was ascribed to several factors, such as the appearance of new infections, etc.

Re-examinations were undertaken and 4 films each of 20 cmm. were made in succession. Out of 291 found positive when 4 films were examined there were:—

positive in the first film, 45%
,, ,, ,, second film, 62%
,, ,, ,, third film, 82%

Of 148 who were negative in a single film, 22% were positive when 4 films were examined. This experience demonstrated that results computed from one film to each person gave quite inaccurate statistical results.

With the prophylactic dose of diethylcarbamazine quoted above it was found that in positive cases *immediately* after treatment the microfilariae were reduced to 7% but increased 1 year later to 40 or 50% of the previous numbers.

Five schemes of treatment with the basic dosage of 2 mgm. per kgm. 3 times daily were initiated: (1) 1 day per week; (2) 4 consecutive days every 3 months; (3) 1 day each month; (4) 2 days every 6 months; (5) 4 days every 6 months.

The first 3 schemes gave results of comparable value, but the last two were less satisfactory. On the other hand the first two were extremely onerous to put into operation. Therefore the third programme was chosen. In each 100 carriers after 1 day's treatment per month, 8% were positive after one year. Efforts to improve the technique of treatment were successful with tablets called *lenterules* designed to be slowly absorbed so as to reduce the scheme of treatment to one tablet daily. The preparation is known as *Notézine-retard* and is given in dosage of 6 mgm. per kgm. once daily on one day each month. Five schedules were tried which included *Notézine-retard* and ordinary Notézine, separately or together.

The following results were obtained. With the ordinary Notézine routine there was a decrease of microfilaraemia after 24 hours, followed subsequently by a gradual rise. Compared with this the *lenterules* had a less satisfactory action in the first two hours, but better results after 24. Eventually this scheme was discontinued. The best and most permanent results were obtained with 3 mgm. of Notézine per kgm. twice daily on one day each month. The action of this drug on the adult worms is difficult to ascertain, especially as after the lapse of a few months the microfilariae tend to reappear in the blood stream. The authors think, however, in the case of thiacetarsamide the action on the adults is direct, because, though the microfilariae take a long time to disappear, the

ultimate action is final [but see abstracter's comment, this *Bulletin*, 1957, v. 54, 71]. Eosinophilia appears to vary with treatment, not with reference to the duration or frequency of treatment, but merely in relation to its effect upon the microfilariae. Neither is there any correlation between the height of the eosinophilia and the number of microfilariae in the circulation. A sudden increase in the eosinophilia immediately after treatment suggests that it is in response to the massive liberation of proteins as the result of destruction of microfilariae, and the subsequent decline of eosinophilia indicates a diminution of the infection as the result of treatment.

The remainder of this long paper concerns itself with the treatment of hydrocele with sclerosing fluids, which was successful, and the treatment of elephantiasis of the legs (over 200) with Unna's boot and bandaging.

[See also this *Bulletin*, 1953, v. 50, 738; 1954, v. 51, 503.]

Philip Manson-Bahr

Jaswant Singh, Krishnaswami, A. K. & Raghavan, N. G. S. **Filariasis in Travancore-Cochin State. II. Shertallai Taluk.** *Indian J. Malariology.* 1956, Dec., v. 10, No. 4, 317–25, 1 map & 2 graphs.

A detailed filariasis survey was carried out in Shertallai Taluk—a damp, waterlogged, sandy area in Travancore-Cochin State which had been previously surveyed by Iyengar [this *Bulletin*, 1939, v. 36, 148]. Of 8,463 persons examined 1,766 were found to harbour microfilariae, all except 16 of these infections being *Wuchereria malayi*. The infection rate varied in villages from 9·0 to 33·1%, and on examination of age grouping was found to rise to its height of 22% in the 6–10-year age-group. Infections were found in 5·03% of *Mansonia annulifera* and in 1·64% of *M. uniformis*, but not in any of the 11 other species of mosquito recorded. Systematic efforts at control by removal of *Pistia* from tanks, carried out since the previous survey, do not appear to have materially reduced the incidence.

G. Macdonald

Duke, B. O. L. **The Intake of the Microfilariae of** *Acanthocheilonema perstans* **by** *Culicoides grahamii* **and** *C. inornatipennis*, **and their Subsequent Development.** *Ann. Trop. Med. & Parasit.* 1956, Mar., v. 50, No. 1, 32–8, 1 fig.

The amount of blood ingested by single *Culicoides grahami* and *C. inornatipennis* was derived as a mean from weighings of 50 to 100 unfed and gorged specimens of each species. The mean weight per unfed fly was 0·035 mgm. (*C. grahami*) and 0·063 mgm. (*C. inornatipennis*) with blood meals, respectively, of 0·044 mgm. and 0·065 mgm. Flies were fed on a volunteer with 2,400 microfilariae of *Acanthocheilonema* [*Dipetalonema*] *perstans* and 400 microfilariae of *Loa loa* per 50 cm. of blood and

whose skin-snips also revealed *Onchocerca volvulus* and *D. streptocerca*. The last species of worm was not detected below the knee and all midge feeds were made on the lower legs.

Neither of the microfilariae in the skin were found in 100 or more of both species of midge dissected after a blood-meal on the volunteer. Expected intakes of microfilariae of *D. perstans* by *C. grahami* and *C. inornatipennis* were, respectively, 2·07 and 3·19 per midge but the actual range was from 0 to 18 microfilariae (geometric mean intake for *C. grahami* was 1·67 and for *C. inornatipennis* 1·43). *Loa loa* microfilariae were ingested by few of the midges and, as for *D. perstans*, the intake was less than estimated from the density of the microfilariae in the volunteer's blood. Over a period of 10 days, full development of *D. perstans* was obtained in both *C. grahami* and *C. inornatipennis* and there is some evidence that more of the ingested microfilariae succeeded in developing fully in *C. inornatipennis* than in *C. grahami*. Natural infection in both species of midge at the time of these experiments was very low (0·5% positive or less in about 500 dissections of each species). Mortality of flies in the laboratory experiments was very high for *C. inornatipennis*.

A figure shows the concentration of microfilariae of *D. streptocerea* and *O. volvulus* per mgm. of skin in different parts of the body of the volunteer.

[See also Nicholas and Kershaw, this *Bulletin*, 1955, v. 52, 66.]

D. S. Bertram

Kershaw, W. E., Deegan, T., Moore, P. J. & Williams, P. **Studies on the Intake of Microfilariae by their Insect Vectors, their Survival, and their Effect on the Survival of their Vectors. VIII.—The Size and Pattern of the Blood-Meals taken in by Groups of *Chrysops silacea* and *C. dimidiata* when feeding to repletion in Natural Conditions on a Rubber Estate in the Niger Delta.** *Ann. Trop. Med. & Parasit.* 1956, Mar., v. 50, No. 1, 95–9.

Observations are reported on the amount of blood ingested by *Chrysops silacea* and *C. dimidiata* feeding on African volunteers offering themselves as bait under natural conditions in a rubber estate at Sapele in Nigeria. The size of the blood meal per fly was later estimated by measuring the haemoglobin ingested, the contents of flies being extracted just after the meal in sodium hydroxide and stored in ampoules for a fortnight until estimations by spectrophotometer could be made at Liverpool.

Previous observations on wild-caught *C. silacea* at Kumba gave a mean unfed weight of 15·3 mgm. per fly and blood meals, in the laboratory, of 35·4 cmm. per fly [this *Bulletin*, 1955, v. 52, 186]. Corresponding results in the present observations were, for *C. silacea*, 12·9 mgm. for an unfed fly and a mean blood meal of 24·2 cmm. For *C. dimidiata*, the unfed weight was 10·5 mgm. and 19·7 cmm. of blood per fly was ingested.

Variation about these means took the form of a normal frequency distribution. The basic fact emerges that both species of fly ingest about twice their weight of blood.

[For Part VI in this series, see this *Bulletin*, 1955, v. 52, 1125.]

D. S. Bertram

Faust, E. C. **Human Infection with Species of** *Dirofilaria*. *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 59–68, 1 fig. [Numerous refs.]

"1. This communication provides a reëvaluation of the published reports of human infection with species of the genus *Dirofilaria*.

"2. On the basis of their morphologic characters and anatomical location in the human host, three of these species, each with a single human record, viz., *D. magalhãesi*, *D. louisianensis* and *D. spectans*, are referable to the sub-genus *Dirofilaria* Faust, 1937, of which *D. immitis*, the dog 'heart worm', is the type species.

"3. All of the remaining 34 specimens (except possibly nos. 33–37), in so far as they can be interpreted from accompanying descriptions are referable to the sub-genus *Nochtiella* Faust, 1937. All examples of this group were recovered either from subcutaneous tissues from the upper extremities, trunk and face, or from the orbit, corneal conjunctiva and eyelid. Four specimens (one male, three females) were mature, while all of the remaining 29 (except possibly no. 37) were immature. In all but one instance the immature worms were females: for this reason it is not possible to assign them categorically to a described species.

"4. Two new cases of infection with immature females of the sub-genus *Nochtiella* are reported, one from a subcutaneous nodule on the hand of a white female patient in Florida, U.S.A., and one from the corneal conjunctiva of a Chinese woman in Thailand. These worms, as well as the two previously reported from natives of Florida [see this *Bulletin*, 1952, v. 49, 980], have been found to have longitudinal cuticular striations characteristic of the species of *Nochtiella* and lacking in species of the sub-genus *Dirofilaria*.

"5. A majority (26) of the cases of human infection with *Nochtiella* (nos. 33–37 sub judice) have originated in southern Europe and the eastern Mediterranean countries, but isolated specimens obtained from Asia (2), Africa (2), U.S.A. (3) and Argentina (1) have contributed to the total number (34).

"6. Even though man is an abnormal host for *Nochtiella*, as a rule the tissue reactions produced in the human host have been of relatively low grade, consisting of mild inflammation and nodule formation around the living worm. In only one instance there was an associated pathologic diagnosis of 'orbital neoplasm'. In at least three cases there was evidence of a migratory condition preceding extraction of an immature worm.

"7. Three of the specimens of *Nochtiella* (one an adult male, 2

immature females) have been diagnosed by their reporters as *D. repens*, while a majority have been allocated to *D. conjunctivae*. Some of the investigators of this group of filaria worms consider the latter to be the same as *D. repens*, but the present writer regards the information as inadequate for this assumption, particularly for the specimens described from the Western Hemisphere, where *D. repens* has thus far not been reported for the dog, its common natural host.

"8. The method of human exposure to species of *Dirofilaria* has not been elucidated but it seems probable that the cycle involves an insect vector (most likely a mosquito), which inoculates the infective stage into the human host. This is typically a 'dead-end' cycle, since there is thus far no evidence that viable microfilarias are produced by female dirofilarias in the human host."

Crosskey, R. W. **The Simuliidae (Diptera) of Northern Nigeria.** *Bull. Entom. Res.* 1957, Mar., v. 48, Pt. 1, 59–74, 7 maps & 1 fig.

The area here surveyed lies between 7 and 14°N. and 3 and 14°E. Most of the rivers rise on the Bauchi (Jos) Plateau (4,000–5,000 feet above sea level) and drain into the Niger or the Benue. The valleys of these two principal rivers are low-lying, at altitudes of 130–800 feet. North of the 11–12° parallels the rivers dry up for some months of the year; south of these latitudes most rivers continue to flow throughout the year.

All the 14 species recorded here were collected in the pupal stage. Notes are given on the pupae of some of the species, including a description and figure of the pupa of *Simulium colas-belcouri*. *S. kenyae* is recorded for the first time from W. Africa. Only *S. damnosum* and *S. bovis* are troublesome as adults, and only 3 other species were captured as adults. The distributions of the species are briefly described, mainly by maps. Notes are also given on the breeding habitats and preferred substrata of the pupae of the different species. *S. damnosum* is found in the larger, swift-flowing, rocky rivers, and also in smaller rivers, usually not less than 40 feet in breadth, with a rock substratum, between altitudes of 150 and 4,000 feet. The presence of a willow (*Salix ledermannii*) is associated with the occurrence of *S. damnosum* between latitudes 9–12°N. The pupae have been found most commonly on trailing grasses in the water, but were also recorded from sticks, loose stones and dead leaves, though not from solid rock. Species found associated with *S. damnosum* were *S. cervicornutum*, *S. unicornutum*, *S. adersi*, *S. griseicolle*, *S. medusaeforme* and *S. bovis*. Only *S. damnosum*. *S. adersi* and *S. ruficorne* were recorded north of 12°N.

The author concludes that the distribution of Simuliidae in N. Nigeria depends on the distribution of suitable breeding rivers, which depends mainly on the geology of the country. Most breeding is associated with pre-Cambrian deposits, the later sedimentary deposits producing smoother

rivers with sand or mud bottoms almost devoid of *Simulium* breeding. Altitude and the type of vegetational zone through which the rivers flow do not appear to determine the distribution of most of the species, although most breeding places are found in the Guinea savannah. Perennial breeding is not found in the north of the area where the dry season lasts for more than 6 months, although some seasonal breeding has been recorded.

[See also this *Bulletin*, 1957, v. 54, 594, 595, 596.] *B. R. Laurence*

Gould, S. E., Gomberg, H. J., Villella, J. B. & Hertz, C. S. **Studies on *Trichinella spiralis*. VI. Effects of Cobalt-60 and X-Ray on Morphology and Reproduction.** *Amer. J. Path.* 1957, Jan.–Feb., v. 33, No. 1, 79–105, 2 text figs. & 17 figs. on 8 pls. [11 refs.]

"Excysted larvae of *Trichinella spiralis* were exposed to various doses of cobalt-60 and of x-ray and then fed to white rats to determine the effect of these forms of radiation on prevention of reproduction of the worms, on the rate of elimination of the worms from the intestine of the host, and on the length of the body of intestinal trichinae at various intervals after infection. In addition, direct observations were made, on living and fixed trichinae, of morphologic changes appearing at various intervals following infection with larvae exposed to different doses of radiation."

The dose of cobalt-60 required to produce a given effect was three times the dose of X-ray.

"Exposure of trichinella larvae to 5,000 to 10,000 rep cobalt-60 or to 2,000 or 3,000 r. x-ray greatly reduced their reproductivity; doses of 12,000 rep and over of cobalt-60 and 4,000 r. and over of x-ray produced sexual sterilization of practically all trichinae. In rats fed larvae exposed to 18,000 rep cobalt-60 or 7,000 r. x-ray, all or nearly all trichinae were eliminated from the small intestine within 36 hours after infection."

Morphological abnormalities in the forms developing from irradiated larvae were proportional to the radiation dosage; growth was retarded and limited, the gonads of the males and females were degenerate, and few females were inseminated.

[For Parts I to V of this series, see this *Bulletin*, 1956, v. 53, 228.]

W. E. Kershaw

Haskins, W. T. & Weinstein, P. P. **Nitrogenous Excretory Products of *Trichinella spiralis* Larvae.** *J. Parasitology.* 1957, Feb., v. 43, No. 1, 19–24. [19 refs.]

"*Trichinella spiralis* larvae were incubated aerobically under axenic conditions. Chemical analysis of the incubates showed the presence of 400 to 600 micrograms of nitrogen per 100,000 larvae per 24 hours incubation. The nitrogenous products consisted of 33·3% ammonia

nitrogen, 7·4% volatile amine nitrogen, 20·8% peptide nitrogen, and 28·5% amino acid nitrogen with 10% of the total nitrogen unaccounted for."

Haskins, W. T. & Weinstein, P. P. **Amino Acids excreted by** *Trichinella spiralis* **Larvae.** *J. Parasitology.* 1957, Feb., v. 43, No. 1, 25–7.

"*Trichinella spiralis* larvae were incubated aerobically in saline under axenic conditions. The saline incubates were concentrated and examined for amino acids by paper chromatographic techniques. The following amino acids were identified: glutamic acid, serine, glycine, alanine, tyrosine, valine, methionine, leucine, phenylalaline, and proline. Amines present in the incubates were shown not to interfere with the identification of the amino acids under the experimental conditions used."

Haskins, W. T. & Weinstein, P. P. **The Amine Constituents from the Excretory Products of** *Ascaris lumbricoides* **and** *Trichinella spiralis* **Larvae.** *J. Parasitology.* 1957, Feb., v. 43, No. 1, 28–32.

"*Trichinella spiralis* and *Ascaris lumbricoides* larvae were incubated in saline under axenic conditions for 24 hours. Alcoholic extracts of the acidified concentrates of these incubates were examined for the presence of aliphatic primary amines by paper chromatographic techniques. *T. spiralis* larvae were shown to produce methyl, ethyl, propyl, butyl, amyl, and heptyl amines, ethylene diamine, cadaverine, and two hydroxy amines, ethanol amine and 1-amino-2-propanol. Allyl amine was also provisionally identified. *A. lumbricoides* larvae produced all of these amines with the exception of amyl and heptyl amines and ethylene diamine.

"The egg-fluid inside the vitelline membrane surrounding the larvae of *A. lumbricoides* was also examined by the same technique and was shown to contain qualitatively the same amines present in the incubates from the larvae."

Vogel, H., Widelock, D. & Fuerst, H. T. **A Microflocculation Test for Trichinosis.** *J. Infect. Dis.* 1957, Jan.–Feb., v. 100, No. 1, 40–47. [15 refs.]

A new flocculation test is described in which a cholesterol-lecithin mixture is used as a vehicle for the antigen prepared by extracting lyophilized *Trichinella* larvae. This is compared with the flocculation test of Bozicevich *et al.* [this *Bulletin*, 1952, v. 49, 431], and with a complement-fixation test, on samples of blood submitted by physicians from patients suspected of having trichinosis [for details of the test the original should be consulted].

"The major criteria [for the diagnosis of trichinosis] included (1) periorbital edema, (2) pain or tenderness in muscle, (3) eosinophilia, (4) recovery of the parasite by muscle biopsy and (5) a history of ingestion of incompletely cooked pork in association with at least one verified case of trichinosis. The minor criteria were (1) acute onset with fever including symptoms and signs of gastroenteritis or ocular pain and inflammation, (2) positive trichinella skin test, and (3) a history of ingestion of incompletely cooked pork or meat in which the parasite had been demonstrated. For a positive diagnosis of trichinosis the presence of two major manifestations was required, or one major together with two minor manifestations."

Of 177 clinical cases of trichinosis 11 were completely negative in the complement-fixation and Bozicevich's flocculation test, and 15 were completely negative in the complement-fixation tests and the new flocculation test. The new flocculation test failed to detect antibodies in 2 of the 18 patients in whom the larvae of *T. spiralis* had been found on muscle biopsy.

The test is more specific though less sensitive than the complement-fixation test or Bozicevich's flocculation test. Since serological examination may have negative results shortly after the onset of the disease such examinations should be repeated up to 9 weeks after the onset of symptoms. *W. E. Kershaw*

DEFICIENCY DISEASES

Commission for Technical Co-Operation in Africa South of the Sahara. [C.C.T.A.] **Inter-African Nutrition Conference. III Session.** Luanda, 1956, Oct. 205 pp. Reports H NU 3. London: 43, Parliament Street, S.W. 1.

Previous Inter-African Nutrition Conferences have been held in the Cameroons in 1949 and in the Gambia in 1952. This report of the third conference shows that it was well attended by over 50 members representing most of the countries concerned and also the United Nations special agencies. About one hundred scientific communications were read. The titles of these only are given, but the report gives in full in Portuguese, English and French the speeches at the opening and closing sessions and a formal list of conclusions and recommendations. The omission of the technical communications from the report removes the interest for scientists.

The conclusions and recommendations form a clear and straightforward statement of the nutritional problems of Africa and of orthodox methods of attacking them. The statement is aimed at "Member Governments", and those who attended the conference have forged a handy weapon with

which to attack their governments with a demand for more support for nutrition work. It is sincerely to be hoped that the attacks will be successful. Much first-class nutrition work is coming out of Africa already, but not nearly enough to allow the rapid development of the health of the people.

Copies of the Report can be obtained from the Publications Officer, CCTA, 43, Parliament Street, London, S.W.1. *R. Passmore*

Desikachar, H. S. R., Sankaran, A. N. & Subrahmanyan, V. **The Comparative Value of Soyabean and Bengal Gram as Supplements to the Poor South Indian Rice Diet.** *Indian J. Med. Res.* 1956, Oct., v. 44, No. 4, 741–8. [11 refs.]

When rats on a basal rice diet were given a supplement of pulses, growth rates were increased. Soya bean flour (autoclaved to destroy a tryptic inhibitor and other anti-growth factors) caused a greater increase in growth rate than did Bengal gram. However, the authors properly express doubt about the relevance of this finding to human nutrition.

R. Passmore

Moussa, K. Die differentialdiagnostische Bedeutung der Pellagra. [**Differential Diagnosis of Pellagra**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 192–6, 2 figs.

In mid-Europe the so-called "secondary pellagra" is of great clinical interest. It can occur after bowel resection, chronic diarrhoea, sprue and in various mental states where metabolism is concerned.

To illustrate the confusion which may arise a case of pellagra with acute manifestations is described. A 14-year-old boy was admitted to hospital in Cairo as a case of epidemic cerebrospinal meningitis with hyperkeratosis of the extremities which was mistaken for ichthyosis. However, the rectal temperature was normal and the cerebrospinal fluid unchanged. Schistosomal eggs were present in urine and faeces. No improvement resulted from penicillin and sulphonamide therapy. Eventually the possibility of acute pellagra was considered and instantaneous improvement resulted from treatment with nicotinic acid. In a second instance the diagnosis of funicular myelosis had originally been formulated. *Philip Manson-Bahr*

Rosenthal, F. D. & Lees, F. **Addisonian Crisis due to Pellagra.** *Lancet.* 1957, Mar. 30, 665–6. [12 refs.]

"The clinical and biochemical features of a crisis in a woman with pellagra suggest an acute failure of mineralocorticoid metabolism. Reports of selective damage of the zona glomerulosa of the adrenal cortex in pellagra provide a possible pathological basis for this failure."

HALLGREN, B. **Haemoglobin Formation and Storage Iron in Protein Deficiency.** *Acta Soc. Med. Upsaliensis.* 1954, Mar. 31, v. 59, Nos. 3/4, 79–208, 13 figs. [Numerous refs.]

GUHA, P. K. **Clinical and Therapeutic Observations on Protein Deficiency in a Group of Patients and its Management.** *Calcutta Med. J.* 1956, Nov. & Dec., v. 53, Nos. 11 & 12, 375–81; 423–33 & 1957, Jan., v. 54, No. 1, 20–26. [78 refs.]

These three papers describe with a wealth of clinical and biochemical detail the treatment of 58 patients diagnosed as suffering from protein deficiency. Oedema, anaemia and a low level of serum protein were the main diagnostic criteria. The protein deficiency arose as a result of a previous poor diet often aggravated by pregnancy or by chronic dysentery and other disease. Protein hydrolysate was given either by mouth or intravenously. The usual intravenous dose was 100 to 300 ml., but up to 1900 ml. were given to some patients.

The response to treatment, as judged by the clinical findings and the biochemical changes, appears to have been very satisfactory. [However, owing to the varied initial condition of the patients, the different general treatment given and the absence of any clinical controls, it is difficult to assess how much of the improvements can be legitimately ascribed to the protein hydrolysates.] *R. Passmore*

GOPALAN, C. & RAMANATHAN, K. S. **Response to Water Load Tests in Induced Protein Deficiency.** *Indian J. Med. Res.* 1957, Jan., v. 45, No. 1, 65–70. [16 refs.]

A test dose of water (5% of body weight) was given to monkeys on a control diet, on a high-calorie low-protein diet and on a low-calorie low-protein diet. There were 6 or 7 monkeys in each group. After 4 hours the mean urinary excretion was 86% of the dose of water in the control group, 45% of the dose in the high-calorie low-protein group and 64% of the dose in the low-calorie low-protein group.

Possible reasons for the greater impairment of urinary secretion in the high-calorie low-protein group are discussed. Liver damage associated with the high-calorie diet might impair the normal function of the liver in inactivating anti-diuretic substances. *R. Passmore*

ALEXANDER, H. D. & SAUBERLICH, H. E. **The Influence of Lipotropic Factors on the Prevention of Nutritional Edema in the Rat.** *J. Nutrition.* 1957, Mar. 10, v. 61, No. 3, 329–41. [14 refs.]

"The edema observed in animals fed a protein deficient diet was prevented by the methyl compounds, choline, dimethylaminoethanol,

betaine and methionine. Vitamin B_{12} was also effective, and its action was increased by the addition of folacin, which alone was without effect. Longevity and body weight of rats were also improved by a supplement of vitamin B_{12} and folacin and to a lesser extent by choline.

"The resemblance of the pathology of the edematous rats to that in human cases of kwashiorkor has been discussed."

Scrimshaw, N. S., Béhar, M., Viteri, F., Arroyave, G. & Tejada, C. **Epidemiology and Prevention of Severe Protein Malnutrition (Kwashiorkor) in Central America.** *Amer. J. Pub. Health.* 1957, Jan., v. 47, No. 1, 53–62, 2 figs. [18 refs.]

This paper reviews the position of protein malnutrition with special reference to Central America. Nearly all children in rural and poor urban areas suffer to some extent. Social and economic factors, such as the death of a parent, separation of the family or loss of work of the wage earner are often contributory causes of the dietary deficiency. Common infectious diseases of childhood, especially severe upper-respiratory infections and infectious diarrhoea, contribute to the appearance of severe manifestations of the disease. General measures to improve the health of children are desirable, but will not substitute for improved nutrition. [This is a very clear and concise review article.] *R. Passmore*

Venkatachalam, P. S. & Ivinskis, V. **Kwashiorkor in New Guinea.** *Med. J. Australia.* 1957, Mar. 2, v. 1, No. 9, 275–7, 3 figs.

This paper describes kwashiorkor in New Guinea. In the course of a month 18 children with the disease were seen in various hospitals. The clinical picture does not differ from that reported in other parts of the world. *R. Passmore*

Mehta, G. & Gopalan, C. **Haematological Changes in Nutritional Oedema Syndrome (Kwashiorkor).** *Indian J. Med. Res.* 1956, Oct., v. 44, No. 4, 727–36. [12 refs.]

The haematological picture was studied in 18 children with kwashiorkor. In 15 the haemoglobin level on admission was between 8 and 12 gm./100 ml. of blood, and a more severe anaemia was present in only 3. None of the children were infected with malaria or hookworm. In most of the patients the anaemia was macrocytic, but in two microcytic and hypochromic. Gastric secretion of acid was found to be markedly depressed. Improvement was slow in all patients and in some a high protein diet had to be supplemented with folic acid or vitamin B12.

It is postulated that in the evolution of the anaemia there was a

deficient supply, as well as deficient utilization, of the nutrients concerned. A pronounced eosinophilia frequently occurred during treatment with skim milk. *R. Passmore*

Waterlow, J. C., Bras, G. & DePass, E. **Further Observations on the Liver, Pancreas and Kidney in Malnourished Infants and Children. II. The Gross Composition of the Liver.** *J. Trop. Pediatrics.* London. 1957, Mar., v. 2, No. 4, 189–98. [20 refs.]

The fat and protein content of the livers of 51 children dying in Jamaica between the ages of 2 months and 3 years was determined. Of these 31 had some form of nutritional disorder (16 kwashiorkor, 9 marasmus and 6 malnutrition and infection); in the remaining 20, most of whom had died of acute infections, there was no evidence of a primary nutritional defect. The mean amount of excess fat in the livers from the kwashiorkor group was 145 gm. and greater than the figures in the other 3 groups (38, 57 and 53 gm., respectively). The mean total protein content of the liver was only 67% of the expected normal value in the kwashiorkor group; the corresponding figure in the marasmus group was 51·5%, in the malnutrition with infection group 64% and in the control group 80%. There were great variations in the fat and protein contents of the livers in each group.

There was a significant association between the presence of oedema and the fat content of the liver, which are the 2 main diagnostic criteria of kwashiorkor. There was no corresponding association between increase of fat and loss of protein in the liver. In both marasmus and kwashiorkor there is depletion of body protein and the two conditions cannot be distinguished by the *degree* of depletion. It is suggested that a higher calorie intake in kwashiorkor may be responsible for the development of the fatty liver. It is pointed out that the connexion between calorie intake and oedema is not so obvious.

[This is an important paper: an understanding of the fundamental differences between the chemical pathology of kwashiorkor and that of marasmus would assist both the clinical management and the prevention of the diseases.]

[For Part I, see this *Bulletin*, 1957, v. 54, 468.] *R. Passmore*

Catzel, P. & Basson, Hettie. **Muehrcke's Lines in Kwashiorkor and other Nutritional Disorders.** *South African J. Lab. & Clin. Med.* 1956, Dec., v. 2, No. 4, 336–44, 6 figs.

" 1. Forty-seven Bantu children and 13 adults with hypoproteinaemia were investigated to determine whether there was any relationship between the presence of paired white bands in the finger-nails and the serum-albumin level.

"2. The paired white bands were found in 7 children, 6 of whom suffered from kwashiorkor. The serum-albumin level was between 2·2 g.% and 3·6 g.%. On the other hand 6 of the 24 children with normal nails had a serum-albumin level between 1·1 g.% and 2·2 g.%.

"3. It is concluded that there is no specific correlation between serum-albumin levels and paired white bands in Bantu children. It is emphasized however, that these bands, when present, were seen only in cases where some degree of malnutrition was present."

Narasinga Rao, B. S. & Gopalan, C. **Some Aspects of the Hair Changes in Kwashiorkor.** *Indian J. Med. Res.* 1957, Jan., v. 45, No. 1, 85–93. [29 refs.]

The amount of 6 amino-acids present in the hair of various children was determined. The cystine content (expressed as percentage of fat-free, dry hair) ranged from 17 to 25% in 6 healthy Indian children, from 14 to 23% in 6 African children at different stages of treatment for kwashiorkor and from 9 to 23% in 15 Indian children with kwashiorkor. There was no correlation between the degree of discoloration of the hair and the cystine content. It is concluded that the cystine content of hair may be a better indication of the severity of protein malnutrition than the hair discoloration. *R. Passmore*

Dean, R. F. A. & Skinner, M. **A Note of the Treatment of Kwashiorkor.** *J. Trop. Pediatrics.* London. 1957, Mar., v. 2, No. 4, 215–16.

The authors have repeatedly shown that patients with kwashiorkor need a high protein and high calorie diet, but that it is advisable to restrict the amount of sugar, including the lactose of dried milk, because of the danger of causing diarrhoea. Calcium caseinate and a vegetable oil are the principal ingredients of feeding mixtures. Cotton-seed oil is as safe and suitable for this purpose as soya oil, and more readily available in East Africa.

Suitable mixtures are set out in the table overleaf; as a rule 4 or 5 feeds are offered daily and amounts at each only restricted by the child's appetite. *R. Passmore*

Robinson, Una, Béhar, M., Viteri, F., Arroyave, G. & Scrimshaw, N. S. **Protein and Fat Balance Studies in Children recovering from Kwashiorkor.** *J. Trop. Pediatrics.* London. 1957, Mar., v. 2, No. 4, 217–23, 2 figs. [20 refs.]

This paper records metabolic balances carried out on 4 patients with kwashiorkor. The patients had received treatment and were in the stage of late recovery or consolidation of cure. When milk protein was given

Diets used by the Medical Research Council's Infantile Malnutrition Group, Kampala, for the treatment of kwashiorkor.

	Ingredients (gm.)					Value of 100 gm. mixture (gm.)			
	Calcium caseinate	Dried skimmed milk	Sugar	Oil	Water	Calories	Protein	Fat	CHO
For a fairly severe case	50	50	20	30	850	70	5·7	3·0	4·5
For a very severe case	50	0	20	30	900	53	4·0	3·0	2·0
with much diarrhoea	75	25	20	30	850	70	6·7	3·0	2·0
For a convalescent child	0	120	20	30	830	75	4·1	3·0	8·0
	0	120	20	50	810	93	5·0	5·0	8·0

Preparation.

The dried skimmed milk is made into a paste with cold water, and hot water is then added, and brought to the boil with constant stirring. The sugar and oil are added, and the mixture is put into a high-speed electric blender. The volume is made up to 1 litre.

in amounts varying from 2·6 to 9·4 gm. per kgm., nitrogen absorption varied from 74 to 86% (mean 80%). When fat intakes ranged from 0·4 to 3·6 gm. per kgm., absorption was proportional to intake and around 90% complete. The proportion of both nitrogen and fat absorbed was independent of the absolute amounts fed.

The amount of nitrogen retained bore no relation to the absorption or protein intake. In one patient, a boy aged 18 months, 2·6 gm. of protein per kgm. was barely sufficient for a positive nitrogen balance and did not support growth. *R. Passmore*

Suckling, P. V. & Campbell, J. A. H. **A Five Year Follow-Up of Coloured Children with Kwashiorkor in Cape Town.** *J. Trop. Pediatrics.* London. 1957, Mar., v. 2, No. 4, 173–80, 2 figs. [14 refs.]

Out of a series of 90 children with kwashiorkor, 31 died; of the remaining 59, it was possible to follow up 27 for periods of 2 to 5 years. Despite the fact that there was little or no change in the poor social and economic family backgrounds, these children made good progress and not one of the 27 was readmitted for kwashiorkor; on examination at the follow-up no child was found with hepatomegaly or with skin, hair or mucous membrane changes of nutritional origin. Although all the children were below normal weight on admission many were up to the normal standard subsequently.

Liver biopsies were made on 25 children at the follow-up examination. The children were not subjected to biopsy when ill and first admitted, but it can be presumed that all had fatty changes in the liver. Yet at the follow-up examination the livers usually presented a normal histological picture. Severe fatty changes were not seen and in only 3 instances was fat present in very modest amounts in the liver cells. Features of cirrhosis were consistently absent. Other microscopic abnormalities in the section were infrequent and slight.

This paper is important as it demonstrates that complete recovery both clinically and in the liver can occur despite a return to the same family circumstances in which the disease arose originally. *R. Passmore*

Schoental, R. **Herbal Medicines and Disease.** *J. Trop. Pediatrics.* London. 1957, Mar., v. 2, No. 4, 208–14. [37 refs.]

This discoursive essay contains some interesting facts about herbal medicines, a subject on which we are all too ignorant. It is not so informative on disease. The author herself has carried out some excellent experimental work on the toxic effects on rats of alkaloids from plants of the genus *Senecio*. Her attempt to associate kwashiorkor with the consumption of these and other medicinal herbs quite fails to convince. *R. Passmore*

SPRUE

Higgins, J. A., Lee, P. R., Scholer, J. F., Reitemeier, R. J., Code, C. F. & Wollaeger, E. E. **Absorption of Water and Sodium from the Small Intestine of Patients with Nontropical Sprue.** *J. Clin. Investigation.* 1957, Feb., v. 36, No. 2, 265–9. [15 refs.]

"The rate of absorption of isotropically labeled water and sodium from the small bowel in 14 patients with nontropical sprue was abnormally slow when the patients were tested during relapse of their disease. When the patients were tested during remission, the rates approached or became equal to those of healthy persons."

HAEMATOLOGY

Izak, G., Rachmilewitz, M., Stein, Y., Berkovici, B., Sadovsky, A., Aronovitch, Y. & Grossowicz, N. **Vitamin B_{12} and Iron Deficiencies in Anemia of Pregnancy and Puerperium.** *Arch. Intern. Med.* 1957, Mar., v. 99, No. 3, 346–55, 8 figs. (2 coloured on pl.). [48 refs.]

"Of a total of 2500 women examined during pregnancy and in the puerperium, 276 (11%) were found to be anemic (hemoglobin below 10·0 gm. per 100 ml.).

"Hematological examinations and serum iron and vitamin B_{12} determinations were made repeatedly in 100 of these anemic women during the last trimester of pregnancy and in the postpartum period. Thirty of them had hypochromic iron-deficiency anemia with low serum iron and normal serum vitamin B_{12}, eleven patients had hyperchromic macrocytic anemia with very low serum vitamin B_{12} and normal or high serum iron concentrations. Fifty-nine patients showed the morphological features of dimorphic anemia with both low serum vitamin B_{12} and low serum iron values.

"Spontaneous hematological improvement was observed in most patients in the postpartum period together with a gradual increase in serum vitamin B_{12} and iron concentrations.

"Malnutrition, increased requirements during pregnancy, and frequent pregnancies are considered to be responsible for the iron and vitamin B_{12} deficiences."

Plissier, M., Mechali, D., Delons, S. & Fulcrand, G., with the technical assistance of D. Jeames. Deux cas marocains d'elliptocytose constitutionnelle. [**Two Moroccan Cases of Hereditary Elliptocytosis**] *Maroc. Méd.* 1957, Mar., v. 36, No. 382, 253–4.

Boivin, P. Les hémoglobinopathies congénitales. [**Congenital Haemoglobinopathies**] *Semaine des Hôpit.* Paris. 1957, Mar., v. 5 (n.s.), No. 6, P. & B. 705–18. [28 refs.]

A general review and discussion.

Parekh, J. G. **Hereditary Haemolytic Anaemias.** *J. of J.J. Group Hosps. Grant Med. College.* 1957, Jan., v. 2, No. 1, 1–24, 3 charts & 9 figs. (8 on 2 pls.). [42 refs.]

"(1) In this paper is given a short account of hereditary haemolytic anaemias.

"(2) Typical family histories and investigations carried out have been given. One family of congenital spherocytic anaemia, one family of thalassaemia characteristics and one family showing the characteristics of both sickle cell anaemia and thalassaemia have been presented, the last disease being reported for the first time in this part of India."

Stijns, J. & Charles, P. La tare thalassémique chez les Bantous d'Afrique centrale. [**The Thalassaemic Condition in the Bantus of Central Africa**] *Ann. Soc. Belge de Méd. Trop.* 1956, Oct. 31, v. 36, No. 5 *bis*, 763–79, 1 map. [30 refs.]

This paper from Léopoldville is the first report of a considerable incidence of the thalassaemia gene in Africans south of the Sahara. The only previous observation is that of Edington and Lehmann (*Brit. Med. J.*, 1955, Nov. 26, 1328), but these authors had seen the trait in only two families, and what they had observed did not appear to be typical thalassaemia; though foetal haemoglobin was present at an age at which it is usually not found, and haemoglobin A production was suppressed in heterozygotes for the genes responsible for haemoglobins A and S, there was no microcythaemia and no reduced osmotic fragility.

In the present publication a more typical thalassaemia is recorded, and it was found in 35 families coming from 18 different "races" from within the Congo as well as from Angola and French Equatorial Africa. The authors have seen more than 5,000 patients with anaemia in Léopoldville over the last few years. The majority of them were cases of hypochromic microcytic anaemia of early infancy. Once or even several times a month one of them was found to have thalassaemia. So far only thalassaemia minor and no thalassaemia major has been observed.

The major part of the paper is devoted to the description of two families. They were chosen because in each the mother and not the putative father was the carrier of a thalassaemia gene, so that there was a much better certainty of inheritance. Both the women had been married to two men, one of them normal and one a sickle-cell trait carrier (AS). Some of the offspring were therefore normal, others had thalassaemia minor, one was a

sickle-cell trait carrier, and in each family one was found to be doubly heterozygous for both the sickle-cell gene and for thalassaemia, *i.e.*, they were cases of microdrepanocytic disease. Foetal haemoglobin was present in the thalassaemic persons to a varying extent—the authors used the 1 minute denaturation test of SINGER *et al.* (*Blood*, 1951, v. 6, 413) but whereas these authors disregard any values below 1·7%, in the present publication 1·26% is taken as the upper limit of technical error. Similarly the lowest normal osmotic fragility is taken to be a 95–100% haemolysis at 0·30% NaCl. However the following findings would pass the most stringent test for thalassaemia any laboratory could devise. A girl aged 21 months had a haemoglobin level of 12·3 gm.%, a haematocrit of 38·4% and a red cell count of 6·27 million cells per cmm. The MCV was 61 cubic μ and the MCHC was 32%. At 0·30% NaCl only 83% of the cells were haemolysed. The foetal haemoglobin level was 5% and the serum iron level was 118 micrograms per 100 ml. Some of the other findings are perhaps not quite so convincing.

A particularly satisfactory feature of this work is the measurement of the serum iron in all instances. Although the mothers and the children with thalassaemia had a mildly hypochromic blood picture, they were not deficient in iron. This was established by exclusion of possible causes of iron deficiency, particularly of ankylostomiasis, by demonstrating a failure of the hypochromia to respond to iron treatment, and lastly by demonstration of a normal serum iron level. It was thus shown that the inability to produce red cells saturated with haemoglobin was not due to lack of iron but to a failure in utilizing the metal. This inborn error of haemoglobin metabolism is of course the essential feature of thalassaemia.

In both families children with clinical "sickle-cell anaemia" had a non-sickling mother, and the thalassaemia gene was discovered when the relatives of these children were investigated. It was then clearly demonstrated that the true diagnosis was not the classical homozygous sickle-cell anaemia but the doubly heterozygous condition "sickle-cell thalassaemia" or microdrepanocytic disease. In one of the two propositi electrophoretic analysis of the haemoglobin failed to demonstrate any haemoglobin A, although the family study clearly showed that the gene responsible for haemoglobin A was present. Without a family study, on the basis of the electrophoretic analysis alone, the diagnosis of homozygous sickle-cell anaemia might well have been made, and the present paper emphasizes the importance of a family study before such a condition is claimed to be present. It is not possible to decide that the gene for haemoglobin A is absent if the only evidence is the failure to demonstrate haemoglobin A by paper electrophoresis. Only the exclusion of thalassaemia by family study can allow such an assumption. The absence of haemoglobin A in the phenotype may be due to one of two causes: either the gene for haemoglobin A has not been inherited, or the haemoglobin A gene is present but the simultaneous inheritance of a

thalassaemia gene results in a suppression of haemoglobin A production. The penetration of the thalassaemia gene in the phenotype varies from person to person, as is shown in this paper. In some heterozygotes for haemoglobins A and S paper electrophoresis of the haemoglobin will show a lowered proportion of haemoglobin A, in others it may fail to demonstrate any haemoglobin A at all. *H. Lehmann*

Schwartz, H. C., Spaet, T. H., Zuelzer, W. W., Neel, J. V., Robinson, A. R. & Kaufman, S. F. **Combinations of Hemoglobin G, Hemoglobin S and Thalassemia occurring in One Family.** *Blood.* 1957, Mar., v. 12, No. 3, 238–50, 3 figs. [20 refs.]

Went, L. N. & MacIver, J. E. **Investigation of Abnormal Haemoglobins in Jamaica. A Preliminary Study.** *West Indian Med. J.* 1956, Dec., v. 5, No. 4, 247–55, 2 figs. (1 on pl.). [33 refs.]

This paper has as its introduction a useful review of the haemoglobinopathies and it describes in detail findings on 87 people with abnormal haemoglobins studied in Jamaica. No less than 13 of them were cases of sickle-cell-haemoglobin-C disease, and 39 were electrophoretically proven cases of sickle-cell anaemia. Of the latter 14 were adults, one of them a 30-year-old woman with 3 children and another a 40-year-old woman with 1 child. [Unfortunately the laboratory diagnosis of homozygosity is not supported by a family study, and it is not excluded that the adult " sickle-cell anaemia " patients were in fact doubly heterozygous for the genes responsible for haemoglobins A and S, and for the thalassaemia gene. In such people with microdrepanocytic disease failure to demonstrate haemoglobin A by paper electrophoresis in the phenotype is not unusual.]

The authors state that the number of adult cases of sickle-cell anaemia may in fact be greater in Jamaica than their present paper suggests. The 25 children in the series were mostly diagnosed during the last 2 years, whereas the adults had mostly been seen within the last 4 months. This strongly suggests to the abstracter that there are 2 types of sickle-cell anaemia patients in Jamaica: those with true homozygous sickle-cell anaemia, of whom the majority do not reach adult life, and those with microdrepanocytic disease which is a less severe condition. The latter are not diagnosed in childhood but are being recognized in surveys of adult hospital patients.

The authors suggest that sickle-cell anaemia may become less severe with advancing age, and that microdrepanocytic disease is unlikely to occur because the explanation of their 14 adult cases on this basis would require a high incidence of the thalassaemia gene in Jamaica, whereas the gene is rare. [These arguments were also put forward in the Gold Coast

when similar findings were obtained. Family studies then demonstrated that two electrophoretically " homozygous " sicklers were in fact heterozygous, and that there was in the Gold Coast a gene which caused a condition not quite identical with the classical thalassaemia of Mediterranean countries. There was a suppression of haemoglobin A production in sickle-cell trait carriers, and in non-sicklers haemoglobin F was present, but there was no microcythaemia and no raised resistance against haemolysis by hypotonic saline solutions (Edington and Lehmann, *Brit. Med. J.*, 1955, Nov. 26, 1328). A survey of Jamaicans for possession of haemoglobin F at an age at which this pigment is normally no longer found might well help to decide whether this gene is not present in Jamaica and whether it might not be responsible for the high incidence of adults with " homozygous " sickle-cell anaemia. The most urgent need, however, is a family study in all cases where such atypical cases of sickle-cell anaemia have come to light.] *H. Lehmann*

Jacob, G. F. **A Study of the Survival Rate of Cases of Sickle-Cell Anaemia.** *Brit. Med. J.* 1957, Mar. 30, 738–9.

To determine the survival rate into adult life of sickle-cell homozygotes, a survey has been made of 3,362 blood specimens from adults of the Baganda tribe which had been sent to the Pathological Laboratory, Kampala, for Kahn tests. The majority of the samples (2,486) came from the ante-natal clinic, 99 came from mothers in the paediatric clinic and the remainder from male patients seen in the department for venereal diseases.

All were examined for sickling and when found positive they were investigated by electrophoresis. Of 545 sicklers, 542 showed both normal adult haemoglobin (haemoglobin A) and sickle-cell haemoglobin (haemoglobin S) and they were, therefore, by inference heterozygotes for the genes responsible for the two haemoglobins. In three specimens, all from pregnant women, only haemoglobin S was found, though by chemical examination alkali-resistant (foetal) haemoglobin was shown to be present in two at percentages of 13 and 12 respectively. The third specimen could not be examined. Foetal haemoglobin (haemoglobin F) is inherited independently from adult haemoglobin and its variants, and among other haemoglobinopathies it is usually seen in sickle-cell anaemia. The haemoglobin S + F pattern is also known to occur in sickle-cell trait carriers (heterozygotes) with an additional thalassaemia gene, in whom the haemoglobin A production is suppressed in the phenotype because of thalassaemia. A family study which would have helped to differentiate homozygous sickle-cell anaemia from heterozygous sickle-cell-thalassaemia disease could not be performed. However, as thalassaemia is not found among the Baganda the possibility that these 3 people were such haemoglobin AS + thalassaemia heterozygotes is discounted and the

author suggests that the 3 specimens have come from cases of sickle-cell anaemia surviving into adult life.

[No reference is made to the findings of Edington and Lehmann in West Africa (this *Bulletin*, 1955, v. 52, 821; *Brit. Med. J.*, 1955, Nov. 26, 1328). These authors also found adults who showed the "homozygous" sickling pattern and it was at first thought that this was a proof of homozygosity for the sickling gene for the same reasons as those given by the present author. Nevertheless they pointed out that in heterozygotes for the genes for haemoglobin A and S who were also carrying a thalassaemia gene, production of haemoglobin A might be suppressed to such an extent that it might not be discovered in the phenotype. When they examined the families of their supposed "homozygotes" it was shown that these were in fact heterozygotes for the genes responsible for haemoglobins A and S and that in addition they were transmitting to their offspring an independently inherited gene resembling that for thalassaemia. It was associated with haemoglobin F at an age at which this haemoglobin is normally no longer found but differed from the thalassaemia gene in Mediterranean populations by not causing microcythaemia. The relevance of these observations for surveys elsewhere has been discussed by Lehmann and Raper (this *Bulletin*, 1957, v. 54, 339) in their report on a search for a survival rate of sickle-cell homozygotes in another Uganda community. Perhaps the author's failure to consider these previous investigations and their discussions is due to the fact that her "homozygotes" were anaemic whereas the adults with a "homozygous" sickling pattern described by Edington and Lehmann were not, and that she may therefore have thought that these previous findings were not relevant to her patients. The adults seen by Edington and Lehmann were men, whereas the patients seen in Uganda were pregnant women. It is well known, however, that women who are heterozygous for the thalassaemia gene (thalassaemia minor) may have no anaemia until they become pregnant, when a severe anaemia may develop. There may well be a proportion of sickle-cell homozygotes surviving into adult life in Uganda, but the present investigation does not throw light on this question. It cannot be emphasized too strongly that proof of the homozygosity for genes responsible for a variant of haemoglobin A requires exclusion of thalassaemia or of a thalassaemia-like condition and that this cannot be achieved except by a study of the family.] *H. Lehmann*

Diggs, L. W. **The Crisis in Sickle Cell Anemia. Hematologic Studies.** *Amer. J. Clin. Path.* 1956, Oct., v. 26, No. 10, 1109–18, 6 figs. [17 refs.]

The view that in so-called haemolytic crises in sickle-cell anaemia there is no increase in haemolysis is here examined and for this purpose a study was made of 136 out-patients and 30 in-patients with sickle-cell anaemia

at the City of Memphis Hospital, Tennessee. Between them, the patients suffered from 747 crises during the period of observation.

The point is made that a rise above normal in the reticulocyte count and in various laboratory indices does not constitute adequate grounds for assuming that there is an increase in haemolysis in a given case. Comparisons must be made in the same patient between the values found during times of crisis and those present during periods of relatively good health.

No crises which could be termed haemolytic were observed though many clinical crises were encountered. The excretion of urobilinogen in the urine was increased, whether the patient was in crisis or not but " there was no apparent consistent change in the output of pigment . . . at the time of the crisis, as compared with the output during the symptomless periods ". Reticulocytes varied in number during symptomless periods and during crises but again there was no consistent change associated with a crisis.

A true aplastic crisis was observed in only one patient. A few had many reticulocytes and nucleated red cells in the blood; the numbers gadually returned to normal after admission to hospital and it is assumed that they were recovering from aplastic or hypoplastic crises. In a few patients obstructive jaundice was superimposed upon pre-existing haemolytic jaundice.

A. W. Woodruff

Diacono, H. & Castay, Mathilde. Différenciation sérologique des hémoglobines pathologiques de la sicklanémie et de l'hémoglobinose C. [**Serological Differentiation of Sickle-Cell Haemoglobin and Haemoglobin C**] *C.R. Soc. Biol.* 1956, v. 150, No. 10, 1677–8, 1 graph.

In a haemolytic system in which guineapig anti-sheep serum is incubated with sheep cells, the complement can be fixed if rabbit anti-human-foetal-haemoglobin serum plus human foetal haemoglobin are also added. If instead of foetal haemoglobin, normal adult or sickle-cell haemoglobin or haemoglobin C are added, a cross reaction occurs although the complement fixation is not as pronounced as it is with the addition of foetal haemoglobin. Normal adult haemoglobin resembles foetal haemoglobin least in its effect and haemoglobin C resembles it most. The effect of haemoglobin S lies between those of normal adult haemoglobin and haemoglobin C.

[One would like to know how the anti-foetal-haemoglobin serum was prepared and whether the antigen was pure foetal haemoglobin or contained traces of adult haemoglobin as all newborn blood does. Further, one would wish to know whether the sickle-cell haemoglobin and the haemoglobin C were entirely free from foetal haemoglobin. Both in sickle-cell anaemia and in haemoglobin C disease, haemoglobin F may also be found.]

H. Lehmann

Edington, G. M. & Smith, A. N. **The Combined Fragility Test with special reference to the Haemoglobins S and C.** *West African Med. J.* 1957, Mar., v. 6 (n.s.), No. 1, 18–21.

"In isolated instances in diseases due to the abnormal haemoglobins S and C an increased resistance was noted in the erythrocytes following 24 hours incubation. The combined fragility test is of little value in the diagnosis of these conditions. Its value as a laboratory test in the diagnosis of congenital haemolytic icterus was confirmed."

Montestruc, E. & Collet, A. L'hémoglobinose C chez les martiniquais. [**Haemoglobinosis C in Martinique**] *Rev. Méd. et d'Hyg. d'Outre-Mer.* 1957, Mar. 15, v. 29, No. 255, 42.

This article is the first report of the presence of haemoglobin C in Martinique in the French West Indies. In one family two children were found to suffer from sickle-cell-haemoglobin-C disease (SC); one sibling had the sickle-cell trait (AS); and the haemoglobin composition of the parents was AS in the father and AC in the mother. One other child with sickle-cell-haemoglobin-C disease was seen. The father had died, and the mother was a haemoglobin AC heterozygote. In addition one woman with haemoglobins A and C was discovered. *H. Lehmann*

Ransone, J. W. & Lange, R. D. **Homozygous Hemoglobin C Disease in a 79 Year Old Man with Gout.** *Ann. Intern. Med.* 1957, Feb., v. 46, No. 2, 420–24, 3 figs.

"We have presented a case of homozygous hemoglobin C disease with associated gout in a 79 year old Negro man, and to our knowledge, he is the oldest living individual with this hemolytic anaemia."

VENOMS AND ANTIVENENES

Gitter, S., Kochwa, S., De Vries, A. & Leffkowitz, M. **Studies on Electrophoretic Fractions of *Vipera xanthina palestinae* Venom.** *Amer. J. Trop. Med. & Hyg.* 1957, Jan., v. 6, No. 1, 180–89, 2 figs. [18 refs.]

"Six different fractions from the venom of *Vipera xanthina palestinae* were separated out electrophoretically. Eluates of these fractions were tested in mice for lethal, hemorrhagic, neurotoxic and enzymatic activities.

"About 80 per cent of the lethal activity of whole venom was concentrated in the A_3 fraction which was dominantly hemorrhagic. Combined eluates of fractions K_1–A_1 and of A_4–A_5 were exclusively neurotoxic. Indirect hemolytic activity was strongest in fractions A_4 and A_5, while egg yolk-inhibitory activity was preponderant in fractions A_2, A_4 and A_5.

"Specific *Vipera palestinae antiserum* (Pasteur Institute) neutralized the hemorrhagic action of whole venom and of fraction A_3 but it had very little activity against the neurotoxic components of the venom. The bearing of these findings on the pathogenesis of *Vipera palestinae* snake bite syndrome in human beings is obvious."

Fox, I., Grace, W. J. & Debbink, J. P. **A Case of Arachnidism due to the Bite of the Black Widow Spider** (*Latrodectus mactans*) **from Vieques, Puerto Rico.** *Bol. Asoc. Med. de Puerto Rico.* 1956, Nov., v. 48, No. 11, 440–47, 4 figs. [13 refs.]

The first case reported from Puerto Rico.

Plagnol, H. & Martin, P. Électrophorèse du venin d'*Ancistrodon rhodostoma boie*. [**Electrophoresis of** *Ancistrodon rhodostoma boie* **Venom**] *Ann. Inst. Pasteur.* 1957, Apr., v. 92, No. 4, 525–33, 8 figs. [11 refs.]

The English summary appended to the paper is as follows:—

"By paper-electrophoresis it has been possible to obtain six fractions from the venom of *Ancistrodon rhodostoma boie* when dried or fresh and diluted, and five fractions from the fresh venom when fractionated immediately after it is taken.

"Fraction 1+2 is neurotoxic and coagulating; fraction 3 is anti-coagulating.

"When preserved at temperatures below 25°, the solutions of venom are not modified for 30 days. At higher temperatures, the aging is more or less rapid and affects first fractions 1 and 6."

Russell, F. E. & Van Harreveld, A. **Cardiovascular Effects of the Venom of the Round Stingray, "Urobatis halleri".** Reprinted from *Arch. Internat. Physiol.* Liège. 1954, Sept., v. 62, No. 3, 322–33, 6 figs. [10 refs.]

TOXOPLASMOSIS

De Roever-Bonnet, H. **The Epidemiology of Toxoplasmosis.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1957, Mar., v. 9, No. 1, 17–26, 4 figs. [Numerous refs.]

The Sabin-Feldman dye test was performed on the sera of man and animals in Amsterdam; a serum was regarded as positive if the reaction took place at a titre of 1 in 100 or more. The sera of 716 human "suspects" gave 7·5% positive dye tests, chiefly among children with congenital toxoplasmosis and their mothers; the organism was isolated from 2 of these (once from cerebrospinal fluid and in the other from blood and cerebrospinal fluid). The sera of 22 dogs and cats from the homes of positive patients gave 3 positive reactions (2 cats and 1 dog—one cat showing also pseudocysts in the bone-marrow and brain and the other showing *Toxoplasma* in heart culture). The positive dye test incidence in dogs and cats unassociated with cases of human disease was much lower (1 in 88 animals). The sera of wild rats and horses were negative, but animals in slaughterhouses gave positive results—2 out of 31 cattle, 8 out of 23 sheep and 3 out of 25 pigs (it is suggested that these animal infections may have been caused by *Sarcocystis*).

The sera of human beings of the general population gave a much lower dye test percentage; even in slaughterhouse workers it was only 0·9% (this figure would have been 36% if titres as low as 1 in 4 had been accepted), in persons over 60 years old it was 2·3%, and in mothers of stillborn infants it was 3%. Children with tuberculosis gave negative reactions. *P. C. C. Garnham*

Feldman, H. A. & Miller, Louise T. **Serological Study of Toxoplasmosis Prevalence.** *Amer. J. Hyg.* 1956, Nov., v. 64, No. 3, 320–35, 10 figs. [39 refs.]

10 widely scattered groups of human and 24 animal populations were studied in regard to the incidence of dye-test-positive reactions to *Toxoplasma*. The sera were inactivated at 56°C. for 30 minutes and only titres of 1 in 16 or more were considered positive.

21 North Alaskan Eskimos (children and adults) were negative.
4% of 236 Navajo Indians were positive.
11% of 108 Icelanders were positive.
17% of 293 residents of Portland, Ore., were positive.
26% of 184 residents of St. Louis, Mo., were positive.
31% of 270 residents of New Orleans, La., were positive.
35% of 144 residents of Pittsburg, Pa., were positive.
36% of 104 Haitians were positive.
64% of 266 residents of Honduras were positive.
68% of 121 Tahitians were positive.

The antibodies were distributed equally in the two sexes and age of the person tested had little effect after the first decade.

Among laboratory animals, guineapigs showed an infection rate of 27%, but only 5% of rabbits were positive, and none of the rats or monkeys. Cattle sometimes gave a rate as high as 48%; dogs in the United States were up to 59% positive and in a small group in Honduras 86% (6 of 7 animals). Goats, horses, sheep and cats showed a varying incidence of positive reactors.

The paper concludes with a useful discussion on the validity of the dye test for specific diagnosis, with the firm opinion of the authors that they have been unable to identify any antigen other than *Toxoplasma* which reacts with the cytoplasm-modifying antibody. The antibody remains detectable for many years if not for life, with a gradual lowering of the titre of the serum. *P. C. C. Garnham*

Simitch, T., Petrovitch, Z. & Bordjochki, A. L'effet du sommeil hibernal sur *Toxoplasma gondii* chez des *Citellus citellus* infectés expérimentalement. [**The Effect of Hibernation on** *Toxoplasma gondii* **in Experimentally Infected** *Citellus citellus*] *Arch. Inst. Pasteur d'Algérie.* 1956, Sept., v. 34, No. 3, 355–9.

5 *Citellus citellus* were inoculated with a strain of *Toxoplasma gondii* isolated from a dog, 3 while in a state of hibernation and 2 several days before hibernation. The temperatures varied between 6°C. and 19°C. Hibernation prolonged the life of the squirrels even if the infection was introduced before the animals went to sleep, and if after, their lives were prolonged for as much as 6 weeks. The lowered temperature inhibited multiplication of the organism, as shown in one squirrel killed on the 18th day of hibernation when no organisms could be detected in its organs although subinoculation into another squirrel gave rise to an infection with death on the eighth day. [See also Rodhain's results in hibernating marmots, this *Bulletin*, 1952, v. 49, 319.] *P. C. C. Garnham*

DERMATOLOGY AND FUNGUS DISEASES

González Ochoa, A. & De Los Angeles Sandoval, M. Revisión determinativa de algunas especies de actinomicetes patógenos descritas como diferentes. [**Determinative Revision of Some Species of Pathogenic Actinomycetes**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1956, Sept., v. 16, No. 3, 17–25. [16 refs.]

The English summary appended to the paper is as follows:—

"Taking in consideration that the mycological literature describes a large number of aerobic actinomycetes species, as etiological agents of

mycetoma, in contrast with only four species isolated in Mexico from the Mexican cases of this mycosis, we decided to revise the determinative characteristics of some of the former species. The study was performed following the method used during fourteen years in the Laboratory of Mycology, at the Institute of Public Health and Tropical Diseases of Mexico. The results showed that *N.* [*Nocardia*] *leishmani*, *N. convoluta* and *N. phenotolerans* are synonymies of *N. asteroides;* and *N. transvalensis* and *N. pretoriana* are synonymies of *N. brasiliensis.*

"These results suggest that *N. brasiliensis*, the most important species causing the actinomycotic mycetoma in Mexico, and one of the most important in the rest of the American continent, is a world wide species."

Seijas O., O. Contribución al estudio de la paracoccidioidomicosis osea. [**Study of Osseous Paracoccidioidomycosis**] *Gac. Méd. de Caracas.* 1956, Mar.–Apr.–May, v. 63, Nos. 3, 4 & 5, 225–42, 11 figs. [12 refs.]

Discussion and account of what is believed to be the first case of primary osseous paracoccidioidomycosis reported in Venezuela.

TROPICAL OPHTHALMOLOGY

Kobayashi, S., Araki, A. & Sagae, K. **Mass Treatment of Trachoma with Achromycin Ointment in School Children.** *Acta Med. et Biologica.* Niigata. 1956, Nov., v. 4, No. 2, 143–9, 2 figs. [11 refs.]

1% Achromycin [tetracycline] ointment was used daily in the treatment of all cases of trachoma found in 5 primary schools in Japan. Of a total of 1,907 pupils, 84 (4·4%) were found trachomatous.

The authors used MacCallan's classification of the type of trachoma, with the addition of another category, "trachoma dubium" (quasi-trachoma). They did not elaborate upon the nature of trachoma dubium, and it is not clear that these patients were in fact suffering from trachoma, which tends to detract somewhat from the value of this contribution.

The results were as follows:—100% of Tr. dub. and Tr. 1 were cured in 5–8 weeks; Tr. 2 was very slow to cure, the cure rate being only 41% after 10 weeks and 82% after 16 weeks; Tr. 3 exhibited a cure rate of 90% after 7 and after 16 weeks. The cure rate for all the stages of the disease together was 75% after 6 weeks.

This investigation was not controlled by reference to other forms of treatment or to no treatment at all, but the authors feel that Achromycin 1% ointment used daily is at least as effective as either aureomycin or oxytetracycline, and possibly more so. *D. P. Choyce*

Mikuni, M., Sagae, K., Saito, S. & Tsuchiya, H. **Results of Mass-Treatment of Trachoma among School Children with Leucomycin.** *Acta Med. et Biologica.* Niigata. 1956, Dec., v. 4, No. 3, 235–40, 2 figs.

Mikuni, M., Saito, S., Sagae, K. & Tsuchiya, H. (2nd Report.) *Ibid.*, 271–5, 2 figs.

In the first of these studies, the authors used leucomycin tartrate 1% in white petrolatum. Of 893 children examined, 59 (6·6%) were infected with trachoma. The stages of trachoma were classified according to MacCallan, with the addition of trachoma dubium. Contact dermatitis, due to leucomycin, developed in 5 children (8%) after 5–8 weeks. The over-all cure rate was 72·9% in 11 weeks. A comparison indicated that leucomycin is about as effective as erythromycin, and superior to carbomycin in the treatment of the disease.

In the second study, the authors repeated the experiment using leucomycin free-base ointment, 1% in white petrolatum. Application was made once daily.

Of 621 children examined, 43 (6·9%) were infected with trachoma. The over-all cure rate was 69·8% in 12 weeks, *i.e.*, the free base ointment is not quite as effective as the tartrate. On the other hand only two children (5%) developed contact dermatitis.

[Leucomycin is an antibiotic isolated in Japan from *Streptomyces kitasatoensis.*] *D. P. Choyce*

MISCELLANEOUS DISEASES

Sibthorpe, Elsie M. **Tropical Phlebitis in an Ante-Natal Patient.** *East African Med. J.* 1957, Jan., v. 34, No. 1, 3–6, 2 figs.

The author reports the occurrence of phlebitis affecting segments of superficial veins in both lower limbs, and in a few sites in the arms, of a pregnant African woman 2 weeks before full term. Although the patient complained of having had pain and irritation in the limbs for 2 weeks there were no constitutional symptoms and the only abnormal

findings were scattered areas about 2·5 × 1·2 cm. where the skin was slightly raised, indurated, tender and darker than elsewhere. There was no oedema of the limbs. Biopsy showed a very limited segment of the vein wall to be disrupted by granulation tissue and to have a swollen and markedly eosinophilic intima. Phloxinophil inclusion bodies could not be demonstrated owing to fixation of the tissue in formol saline. A healthy baby was later delivered by Caesarean section. No thrombosed pelvic veins were seen at operation and there were no post-operative complications. No relapse occurred during the next month.

This case is of particular interest as it is typical of the milder variety of tropical phlebitis, a disease which has been held to be almost completely confined to males [see this *Bulletin*, 1951, v. 48, 81].

Frederick J. Wright

De Souza, J. L., Lacaz, C. da S. & Pasqualucci, M. E. A. Ophthalmo-Rhinosporidiose. [**Ophthalmo-Rhinosporidiosis**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1957, v. 8, Nos. 1/2, 250–53, 2 figs. [10 refs.]

The main aim of this communication is to present a summary of the hitherto recorded cases of rhinosporidiosis in Brazil.

Details are given of the disease in a 14-year-old boy who developed a lesion on the conjunctiva of the right lower eyelid. The histopathology is characteristic.

Philip Manson-Bahr

Leclerc, H. & Sureau, P. Recherche des bactériophages anti-bacille de Whitmore dans les eaux stagnantes à Hanoi. [**Study of Anti-*Pfeifferella whitmori* Phages in Stagnant Waters at Hanoi**] *Bull. Soc. Path. Exot.* 1956, Sept.–Oct., v. 49, No. 5, 874–82.

Pfeifferella whitmori has simple growth requirements, and pathogenic strains have been isolated from water [Chambon, this *Bulletin*, 1956, v. 53, 498]. Because of the prevalence of melioidosis in Vietnam, the authors wished to get some idea of the incidence there of free-living *Pf. whitmori*. They examined samples of water for the presence of phages for *Pf. whitmori*, using this as an indication of the existence, past or present, of the host bacterium in these waters.

152 samples of water taken from various sources in the vicinity of Hanoi between February and April 1956 were examined for the presence of phage active against one strain, Whitmore 5. 30 (20%) were positive. 24 phages isolated on Whitmore 5 were tested for specificity by spotting on 25 strains of *Achromobacter*, 8 of *Pseudomonas pyocyanea* and 10 of *Flavobacterium*; they lysed none of these strains. The same phages were tested with 36 strains of *Pf. whitmori*. The strains differed in their

reactions with the different phages, showing that the serologically homogeneous *Pf. whitmori* could be divided into a variety of phage-types. The strains from North Vietnam differed from those from South Vietnam.

Elinor W. Meynell

PARASITOLOGY: GENERAL

Ritchie, L. S., Hunter, G. W., Freytag, R. E., Pan, C., Yokogawa, M. & Lin, S. S., with the technical assistance of M. Shimizu, Y. Hishinuma, S. Asakura & C. B. Knox. **Parasitological Studies in the Far East. XII. An Epidemiologic Survey in Shizuoka Prefecture, Honshu, Japan.** *Japanese J. Med. Sci. & Biol.* 1956, Oct., v. 9, Nos. 4/5, 165–77, 1 map. [10 refs.]

"A survey of parasitic infections was made in 22 population centers of Shizuoka Prefecture, Japan, with special attention given to the status of paragonimiasis, schistosomiasis and filariasis. Single-stool examinations were made for 2278 persons, of which 93·6% had intestinal parasites; 91·8% harbored helminths and 33·5% had protozoa. Common helminths included: *A. lumbricoides* 79·9%, *T. trichiura* 58·3%, hookworm 27·4%, *Trichostrongylus* sp. 8·7% and *E. vermicularis* (by Scotch tape) 56·4% of 427 children. The prevalent rate of *Clonorchis sinensis* and *Metagonimus yokogawai* was about 1%, but in one village 7·7% were infected with *M. yokogawai*.

"Intestinal protozoa occurred as follows: *E. histolytica* 4·4%, *E. coli* 22·6%, *E. nana* 13·6%, *Giardia* 4·1% and *I. bütschlii* 0·6%. The highest prevalent rate of *E. histolytica* by community was 9%, while it was only 1% in three rural centers and 5% or less in 14 of 22 places.

"Helminth density indices, based on stool concentrate egg-counts, were determined for comparison with other surveys in Japan. For ascaris and whipworm, the density indices were relatively high. Severe hookworm infections were rare, and cases with blood loss in excess of body compensation were infrequent.

"The occurrence of schistosomiasis exceeded 5% in only one village (Kanaoka), where 26% of the people were positive by the AMS III stool examination. Intradermal tests revealed that much larger portions of the general population had experienced this infection at sometime; as high as 55% gave a positive reaction in one population center. Maximum infection occurred in the age group of 30 years and over, and males were about twice as frequently infected as females. These two observations are in contrast to findings for highly endemic centers.

"The overall prevalent rate of paragonimiasis by stool examination was only 1·9%, but figures of 12·5 and 16·3% were found in two villages. One of the major endemic centers of this disease in Japan occurs to the east of Numazu City, along the Kano River.

"No microfilariae were recovered from 350 blood specimens examined by the Knott concentration technic in a reported endemic center of filariasis."

GAJDUSEK, D. C. *Pneumocystis carinii*—**Etiologic Agent of Interstitial Plasma Cell Pneumonia of Premature and Young Infants.** *Pediatrics.* Springfield, Ill. 1957, Apr., v. 19, No. 4, Pt. 1, 543–65, 3 figs. [204 refs.]

"Pneumocystis carinii, a parasite found almost a half century ago in the lungs of small mammals and of man in Brazil and, subsequently, in the lungs of man and of wild and laboratory rodents in Europe, has been identified with increasing frequency in the lungs of patients dying from interstitial plasma cell pneumonia of premature and young infants. The microorganism is found with considerable regularity in such patients, and has, in addition, been found in material obtained by lung puncture during life. Although its morphologic characteristics and life cycle have been well worked out, its taxonomic position remains a matter of conjecture. It has been tentatively classed as a protozoan of the Class Haplosporidia, but many authors believe it to be a fungus. The organism is not often encountered in the lungs in serial, unselected necropsies, but it has been found occasionally in lungs of older children and adults debilitated by chronic infections or malignant neoplasm and rather more frequently in association with cytomegalic inclusions in the lungs and salivary glands of infants and adults. However, it has been regularly identified in lungs of interstitial plasma cell pneumonia patients with only rare exceptions. Recently infection with what appears to be this microorganism has been transmitted to infant mice and kittens.

"The wide geographic distribution of natural infection with this agent in wild and domestic mammals of many species, the fact that it was first discovered in man and animals in South America, its frequent identification in the lungs of infants afflicted with this unique pneumonia of infancy, a disease which has now been reported in the United States, and the recent identification of Pneumocystis carinii in a diseased human lung from Canada, make it essential that American pediatricians be aware of this parasite as a potential human pathogen. Only further study will establish clearly what role this organism plays in the pathogenesis of human disease and settle the controversy as to whether it is fungal or protozoan."

CSILLAG, A. **Contribution to the Taxonomical Classification of the So-Called** *Pneumocystis carinii. Acta Microbiologica.* Budapest. 1957, v. 4, No. 1, 1–8, 1 fig. [34 refs.]

An apparent parasite seen in the lesions of interstitial plasmocytic pneumonia of infants, and named *Pneumocystis carinii*, has been

regarded by several observers as probably of protozoal nature, by others, including the present author [this *Bulletin*, 1955, v. 52, 578] as probably a species of yeast fungus, and by still others as possibly the intracellular reaction to a virus. Cultures from the morbid lung tissue have sometimes yielded a species of *Saccharomyces*, and, in the present study, the author succeeded in cultivating such a fungus from the lung tissue of 2 out of 5 premature infants who had died of interstitial pneumonia. In both of these cultures the *Saccharomyces* was associated with *Candida albicans* and the separation of these 2 fungi was effected only after several " passages ". Attempts to infect suckling mice with the culture were unsuccessful probably because the fungus loses its pathogenicity after 1 or 2 subcultures.

In an attempt to produce, in culture, the ascus-like parasitic form of the fungus, various media were used and success was achieved with a culture on " Adams' agar " containing " 10 g." [*sic*] corticotrophin and 10,000 units of penicillin per ml. Similar, but larger, ascus-like forms, mixed with blastospores and pseudomycelium, were found in cultures of *Candida tropicalis* on this medium.

From these observations the author concludes that *Pneumocystis carinii* is the " non-specific form of several, related Blastomycetes ".

In a postscript, referring to a paper by Schmid (*Frankf. Ztschr. Path.*, 1955, v. 66, 456) it is stated that that author had identified *Pneumocystis carinii* as *Saccharomyces fragilis*. *J. T. Duncan*

Bird, T. & Thomson, J. **" Pneumocystis carinii " Pneumonia.** *Lancet.* 1957, Jan. 12, 59–64, 11 figs. (7 on pl.). [48 refs.]

Among atypical pneumonias in infancy Continental workers have recognized an entity which they have termed plasma-cell pneumonia. It chiefly affects premature or weakly infants between the ages of 2 and 5 months, objective findings are slight but radiologically marked mottled opacities are found. The mortality varies between 15% and 100% in different outbreaks. The characteristic histological change is the occurrence of an intra-alveolar exudate of foamy or granular appearance in the lung alveoli and thickening of the alveolar septa caused by an infiltrate of mononuclear cells among which plasma cells are prominent. The masses of sponge-like material in the alveoli have been held to be collections of the causal organism and it has been suggested that these might be either protozoa (*Pneumocystis carinii*) or fungi (*Blastomyces*, *Candida* or *Saccharomyces*).

Two children have died from this disease in Dundee within the past 2–3 years and details of these cases and of the post-mortem findings are given. Treatment with penicillin, sulphamezathine, streptomycin, erythromycin, tetracycline, chloramphenicol, pamaquin, mepacrine and Acetylarsen was aimed at eradicating possible causative agents but was

without apparent effect. A point of special importance concerning one of the cases is that hypogamma-globulinaemia was present and plasma cells were absent from the interstitial infiltrate. [Plasma cells are held by many to be the source of gamma globulin.] Of 4 cases of pneumocystis pneumonia so far observed in Scotland it is pointed out that hypogammaglobulinaemia has been present in 2. A possible aetiological association between the two conditions is discussed.

It is stated that knowledge of pneumocystis pneumonia is at present similar to that of leprosy 30 years ago, the " morbid anatomy was clear-cut and accurately indicated the diagnosis, an organism was known but could not be satisfactorily incriminated, and treatment was both empirical and ineffective ". [It could be added that this thorough study of material encountered has done much to further knowledge of the disease, and it may be that those concerned with tropical practice and particularly parasitologists will be able to throw further light on its aetiology.]

A. W. Woodruff

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Lewis, D. J. **Some Insects of Medical Interest from Pepel and Tasso Islands in Sierra Leone.** *West African Med. J.* 1957, Mar., v. 6 (n.s.), No. 1, 10–14. [18 refs.]

Pepel and Tasso are small neighbouring islands, consisting largely of tidal mangrove swamps, 13 miles from Freetown, Sierra Leone.

Previous collections of medically important insects were recorded by Gordon and Davey (*Rev. Applied Entom.*, Ser. B, 1933, v. 21, 164), by Blacklock and Wilson [this *Bulletin*, 1942, v. 39, 253] and by Muirhead Thomson [*ibid.*, 1946, v. 43, 93].

The present author made his collection in January 1956, and it includes, among others, the following insects:—*Phlebotomus freetownensis*, *Culicoides distinctipennis*, *C. austeni*, *Glossina palpalis gambiensis*. Among the 19 species of mosquitoes there were a few adults of either *Anopheles gambiae* or *A. melas*, in 4 of which nematodes were found which were probably *Wuchereria bancrofti*. Larvae of *A. hargreavesi* were also found. The remainder of the mosquitoes were Culicines, mostly collected as larvae. Perhaps those whose presence is of chief interest are a species of *Aëdes* provisionally regarded as *grahami* which is an important biter in tree-tops in Nigeria; also *Aëdes aegypti* and *Aëdes africanus*.

H. S. Leeson

Mihályi, F. & Zoltai, N. **Contributions to the Occurrence of** *Culex pipiens molestus* **in Hungary.** *Acta Zool.* Budapest. 1956, v. 2, Nos. 1/3, 263–8. [Summary taken from *Rev. Applied Entom.* Ser. B. 1957, Mar., v. 45, Pt. 3, 46.]

The authors cite *Culex pipiens molestus* Forsk. as a subspecies of *C. pipiens* L., in accordance with the terminology of Monchadskiĭ, but consider that it would be better to regard it as an ecological race, since it is characterised less by morphological criteria than by its ecology and behaviour, notably its tendency to attack man and its autogeny, stenogamy and homodynamy. The only evidence of its occurrence in Hungary prior to 1950 was provided by Vincent's rearing experiments with *pipiens* mosquitos collected near Lake Balaton, which indicated that they included *pipiens-molestus* hybrids, but the authors were occasionally attacked by mosquitos of this complex near Lake Balaton in 1950–51 and have investigated three cases of mosquito nuisance, undoubtedly due to *molestus*, in other parts of Hungary.

One of these cases occurred in August 1950 in a house on the outskirts of Budapest and was brought to an end when a tank in the garden, in which the larvae were numerous, was treated with oil. The pattern of the abdomen of the females was characteristic of *molestus*. A case of more extensive infestation was observed in a textile bleaching factory in Budapest, where workers suffered mosquito attack throughout the winter. Inspections in March 1950 and in February 1954 showed that breeding was taking place in a large, disused, underground drain, where the water had a pH of 7. Rearing experiments with mosquitos collected at this factory showed that they were autogenous, stenogamous and homodynamic, and adults and larvae had morphological characters of *molestus*. Control was achieved by pumping the water from the drain and spraying the walls and cover with DDT. The walls of the affected part of the workshop were also sprayed. The third case occurred over 900 ft. below ground level in a coal mine in northern Hungary, where the mosquitos were breeding in the tepid water of puddles in several galleries. The larvae had the morphological characters of *molestus*. Control was achieved by spraying with DDT in emulsified solution to give a deposit of 1 gm. DDT per sq. m. on the walls of the galleries and a concentration of 1 part per million in the breeding water.

Dikshit, P. K., Mohan, B. N. & Joshi, J. G. **Increased Citric Acid Content in Resistant** *Culex fatigans*. *Indian J. Malariology*. 1956, Dec., v. 10, No. 4, 327–30. [12 refs.]

"In investigation concerning biochemical changes in resistant *Culex fatigans* in different stages was undertaken. There was an increase in the citrate content of resistant strain."

Dimond, J. B., Lea, A. O., Brooks, R. F. & DeLong, D. M. **A Preliminary Note on some Nutritional Requirements for Reproduction in Female** *Aedes aegypti*. *Ohio J. Sci.* 1955, v. 55, No. 4, 209–11. [Summary taken from *Rev. Applied Entom.* Ser. B. 1957, Mar., v. 45, Pt. 3, 46–7.]

As a high rate of oviposition had been obtained in females of *Aëdes aegypti* (L.) fed on a mixture of milk and honey (9:1), an attempt was made to find other proteinaceous materials that would stimulate egg production. Those tried successfully included human serum albumin, human gamma-globulin, haemoglobin, egg-albumin, pepsin, lipase, trypsin, proteose-peptone, and the enzymatic hydrolysates of lactalbumin, casein, soybean meal and yeast. Eggs were also obtained from females of *Anopheles quadrimaculatus* Say fed on skimmed milk, egg albumin and proteose-peptone, but no further work was done with this species. In view of the success with the various proteins, and particularly the protein hydrolysates, females of *Aëdes aegypti* were fed on mixtures of amino-acids, in the hope of determining the basic nutritional needs for reproduction. It was noted that 18 acids were present in fairly large amounts in most of the proteins that had supported egg production. Solutions of these in the proportions in which they are reported to be present in blood and in casein, given daily in honey water to 500 newly emerged females of *A. aegypti* on cotton pads, resulted in the production of 2,600 and 1,600 eggs, respectively, in nine days. These were the most productive of the mixtures of the 18 acids that were tested. A mixture of 13 of the acids yielded 2,000 eggs, but a mixture of ten of them only 29. No eggs were laid when various media were given, each consisting of three or four acids including isoleucine, tryptophane or both. The former of these acids had previously been shown to be important and the latter indispensable. Honey was originally used as an attractant, but a mixture of levulose and dextrose (5 gm. of each in 100 ml. medium) proved to be a satisfactory substitute, and its subsequent use showed that the honey had not been contributing necessary factors. It appeared that the addition of a commercially available salt mixture to the amino-acid mixtures at 0·15 gm. per 100 ml. medium slightly increased egg production.

Busvine, J. R. **A Survey of Measurements of the Susceptibility of Different Mosquitos to Insecticides.** *Bull. World Health Organization.* Geneva. 1956, v. 15, Nos. 3, 4 & 5, 787–91. [12 refs.]

The Busvine and Nash test [this *Bulletin*, 1954, v. 51, 1028], for measuring the level of resistance in mosquitoes, has been widely used and this paper tabulates the median lethal concentrations which have been determined for DDT, dieldrin and gamma BHC against several species

of anopheline and culicine mosquitoes in the form of susceptible strains and, where existent, of resistant strains. The test in question is suitably sensitive for its purpose. Use of the probit method to determine the median lethal concentration assumes normal distribution of susceptibility within a mosquito population and since this may not always be the case in nature the measure should be viewed as a crude approximation. Mortalities for control series are not always published, but these data are desirable. *D. S. Bertram*

See also p. 855, Crosskey, **The Simuliidae (Diptera) of Northern Nigeria.**

Steyskal, G. C. **The Relative Abundance of Flies (Diptera) collected at Human Feces.** *Ztschr. f. Angewandte Zool.* 1957, v. 44, No. 1, 79–83.

The author captured and identified most of the flies visiting human faeces on 8 days in July, August and September in Michigan, U.S.A. Poliomyelitis is commonest in September. Faeces exposed in a town attracted numbers of *Phaenicia* (=*Lucilia*) *sericata* (2,702 specimens out of a total of 3,051 flies captured on 4 days). Only about 2% of the flies captured on the faeces were *Musca domestica*. Faeces exposed in a fruit orchard attracted principally two other species of *Lucilia*, and also *Sarcophaga*, *Phormia* and *Callitroga*. Neither *P.* (*L.*) *sericata* nor *M. domestica* were found visiting the faeces in the orchard. A total of 24 genera of flies belonging to 9 families were recorded from faeces in both localities.

The author notes that fresh faeces have been found to attract species of flies different to those attracted by older faeces, and suggests that the fauna associated with faeces exposed in the open consequently is not the same as that found associated with privies. [It is known also that faeces exposed in the open attract a different fauna from that attracted by faeces deposited in shade.] *B. R. Laurence*

Ascher, K. R. S. & Levinson, Z. H. **The Influence of Protein Addition to the Larval Diet on Oviposition of the Housefly.** *Riv. di Parassit.* Rome. 1956, Oct., v. 17, No. 4, 217–22, 1 fig. [14 refs.]

Some workers have claimed that *Musca domestica*, *Lucilia sericata* and *Phormia regina* are unable to develop their ovaries when fed only on sucrose. On the other hand it has been claimed by others that *Musca domestica* does produce a few eggs when fed on sugar and water. Since most of the substance that goes to form the eggs is laid down in the

larva, the authors have investigated the effect of massive protein addition to the larval diet on the oviposition of the adult *Musca domestica* when fed only on sugar and water.

The results showed that casein, peptone, lactalbumin, egg white, ground fly eggs, dried *Escherichia coli*, baker's yeast, yeast extract or testosterone propionate, when added to the larval food, do not bring about oviposition in the adult. One experiment showed that flies reared on the basic diet (wheat bran) did not lay eggs when fed on sugar and water only, but when the adult diet was supplemented with milk some eggs were laid. When these flies were allowed to feed on dead flies a considerable number of eggs were produced.

The authors conclude that enrichment of the larval diet by various proteins is insufficient for egg formation in the adult. For the production of viable eggs the adult fly requires protein and sugar. It is likely that where this observation had been contradicted in the past, the females had fed on dead flies and this fact was overlooked by the workers concerned. *W. Z. Coker*

Fales, J. H., Bodenstein, O. F. & Beroza, M. **New Pyrethrum Synergist. Evaluation of a 3,4-methylenedioxyphenyl Acetal as Synergist for Pyrethrins and Allethrin against House Flies, Mosquitoes, Roaches, Japanese Beetles.** *Soap.* New York. 1957, Feb., v. 33, No. 2, 79–82, 2 figs.

This paper deals with experiments made with 2-(2-ethoxyethoxy) ethyl 3,4-methylenedioxyphenyl acetal of acetaldehyde to establish it as a new synergist for pyrethrins and allethrin when used against house-flies, mosquitoes, cockroaches and the Japanese beetles, *Popillia japonica*, in the form of sprays and aerosols.

The tests on house-flies and mosquitoes (*Anopheles quadrimaculatus* and *Culex pipiens*) took place in a Peet-Grady chamber and those on the other insects by methods sponsored by the Chemical Specialties Manufacturers Association. The efficiency of the new synergist has been compared with that of piperonyl butoxide when used in sprays, and with sulfoxide when used in an aerosol.

The results of the various tests showed that when the new synergist, which is identical with Sesoxane, was added to sprays or aerosols containing allethrin, cyclethrin or pyrethrins a high degree of synergism was caused. In most tests the new synergist caused a greater knock-down and kill than piperonyl butoxide or sulfoxide. When used alone 2-(2-ethoxyethoxy) ethyl 3,4-methylenedioxyphenyl acetal of acetaldehyde showed some insecticidal properties; the knock-down in house-flies was only 11% in 10 minutes for a dosage of 2 mgm./ml.

There was no loss of performance of aerosols containing the new synergist which had been stored for one year. *W. Z. Coker*

Mer, G. G. & Cwilich, R. **Observations on the Behaviour and Control of Houseflies in a Rural Area in Israel. II. A Laboratory and Field Study of Diazinon (O,O-diethyl-O-2-isopropyl 1-4-methyl-pyrimidil-6-thiophosphate) as a Larvicide.** *Riv. di Parassit.* Rome. 1956, Oct., v. 17, No. 4, 209–16.

In order to minimize house-fly nuisance the use of larvicides is recommended; and this paper deals with laboratory and field tests on the efficiency of Diazinon as a house-fly larvicide.

In the laboratory Diazinon wettable powder in talc was added to the usual breeding medium in the following concentrations:—0·5 p.p.m., 1·0 p.p.m. and 2·0 p.p.m. Four generations of house-flies were reared in a medium containing 0·5 p.p.m. Diazinon. It was observed that there was a development of resistance to Diazinon by maggots of the laboratory strain of the house-fly (*M. d. vicina*). By the fourth generation practically all the maggots pupated. On the other hand maggots reared in a medium containing 1·0 p.p.m. Diazinon remained largely susceptible even after 20 generations of inbreeding in the medium. When reared in a medium containing 2 p.p.m. only a small number of flies emerged and these died soon afterwards.

In the field cow manure obtained from dairy barns and in cattle sheds was treated with Diazinon mixed with fine dry sand, at the rate of approximately 1 gm. Diazinon (active substance) to 1 cubic metre of manure. It was observed that breeding in Diazinon-treated manure was considerably reduced in comparison with untreated manure. 2–3 weeks after cessation of larval control, however, normal house-fly breeding was re-established in the barns.

The use of Diazinon as a fly larvicide in the field must be limited to certain breeding sites only, as the selection of resistant strains may be considerably delayed.

W. Z. Coker

Snow, W. E., Pickard, E. & Moore, J. B. **Tabanidae of the Tennessee Valley Watershed.** *Mosquito News.* 1957, Mar., v. 17, No. 1, 44–9.

Pampiglione, S. Due nuovi casi di miasi oculare: miasi oculare interna anteriore (4° caso in Italia) e miasi oculare esterna congiuntivale. [**Two New Cases of Ocular Myiasis in Italy**] *Nuovi Ann. d'Igiene e Microbiol.* 1957, Jan.–Feb., v. 8, No. 1, 59–69, 8 figs. [25 refs.]

The English summary appended to the paper is as follows:—

"A short review has been made on human cases of Ophthalmomyiasis published in Italy. Two other cases are described: Ophthalmomyiasis interna anterior by *Hypoderma* sp. probably *lineatum*; Ophthalmomyiasis externa conjunctivalis by *Oestrus ovis*. The larvae of *Oestrus ovis* are perhaps of a variety not yet recorded."

Gilles, H. M. **Myiasis in the Gambia.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1957, Mar., v. 51, No. 2, 185.

Cordylobia anthropophaga has been recorded in many parts of Africa, and the writer of this note reports what is believed to be the first account of cutaneous myiasis in the Gambia. It refers to a European child aged 18 months who had a painful furuncular swelling in the right buttock. A larva could be seen in a small hole in the centre of the lesion. It was extracted and proved to be 9 mm. long, dirty white in colour and bluntly pointed at the anterior end. It was subsequently identified as that of *C. anthropophaga*. *H. J. O'D. Burke-Gaffney*

Davis, G. E. & Mavros, A. J. **Observations on the Biology of Argas brumpti Neumann, 1907 (Ixodoidea, Argasidae).** *J. Egyptian Pub. Health Ass.* 1957, v. 32, No. 1, 35–9.

"In a study of *A. brumpti*, observations are reported on the larval feeding time of three lots of 19, 26, and 56, respectively. Complete observations on the rearing of 19 ticks and less extensive observations on the rearing of an additional 22 ticks are presented. Comments are made on general observations and on reports of other workers with this species."

See also p. 798, Kraus, Versuch einer morphologischen und neurophysiologischen Analyse des Stechaktes von *Rhodnius prolixus* Stål 1858. [**Morphological and Neurophysiological Analysis of the Feeding Mechanism in** *Rhodnius prolixus*]

Cwilich, R., Mer, G. G. & Meron, A. V. **Bedbugs resistant to Gamma-BHC (Lindane) in Israel.** [Correspondence.] *Nature.* 1957, Mar. 23, v. 179, 636–7.

Three lots of bedbugs (*Cimex lectularius*) from different parts of Israel have been found resistant to gamma BHC to degrees varying between 5 and 40 times greater than the level of susceptibility in a laboratory strain of the bug. One series, for which experimental data are given, was from a children's home in the Beth Shaan valley where eradication of the bug by experienced workers had been unsuccessful. Tiberias was the origin of another lot but the location is not given for the third batch. *D. S. Bertram*

Mistric, W. J., Jr. & Martin, D. F. **Effect of Sunlight and other Factors on the Toxicity of certain Insecticides.** *J. Econom. Entom.* 1956, Dec., v. 49, No. 6, 757–60.

It is known that climatic factors such as rain, dew, humidity, temperature, sunlight and wind affect the toxicity of insecticides to insect pests

of cotton plants. In this paper the authors report on tests made (1) to determine the effect of dosage levels on the residual toxicities of insecticides, (2) to determine if residues toxic to insects tend to accumulate on plants receiving repeated insecticidal applications, (3) to obtain information regarding the independent effects of sunlight and rainfall on the toxicities of certain insecticides, and (4) to determine the residual effectiveness of the new insecticides—Chlorthion and Bayer 17147. The insect pests used for tests were adult boll weevils, *Anthonomus grandis*, and fourth-instar larvae of the cotton leafworm, *Alabama argillacea*. The insecticides used were toxaphene, BHC, dieldrin, heptachlor, aldrin, endrin, parathion, Strobane, and calcium arsenate. Cotton plants were treated with the insecticides and the insects exposed to them confined in screened cages. Mortality counts were made during a 3-day period after the exposure of the insects to the treated plants.

The results have been largely summarized by the authors as follows:

" (1) BHC, heptachlor, and aldrin were completely ineffective in controlling the boll weevil following a 24-hour exposure of treated plants to 0·87 inch of natural rainfall. Appreciable control was obtained with toxaphene and dieldrin under these conditions.

" (2) A 24-hour exposure of treated plants in outdoor shade at high temperature greatly reduced the residual effectiveness of BHC, heptachlor, and aldrin when used to control the boll weevil. High temperature alone caused practically a total loss in insecticidal toxicity, hence sunlight was not an important factor in reducing the effectiveness of these materials. Toxaphene and dieldrin retained considerable toxicity in outdoor sunlight at high temperature. Sunlight did not affect the toxicity of toxaphene, while it was an important factor in reducing the toxicity of dieldrin.

" (3) Increased dosages of toxaphene, BHC, heptachlor, and endrin slightly increased the initial control of the boll weevil, but not sufficiently to justify the use of the increased dosages . . . [beyond 75% mortality, increasing the dosage $1\frac{1}{2}$ times gives no significant rise].

" (4) Repeated applications of either toxaphene or BHC at 5-day intervals did not result in accumulated toxic residues . . .

" (5) When treated plants were exposed for 24 hours indoors or outdoors, the toxicity of Chlorthion to the boll weevil was reduced slightly more than that of toxaphene. Strobane compared very favorably with toxaphene in both initial and residual control. The residual effectiveness of Bayer 17147 at a low dosage was far superior to that of toxaphene.

" (6) The effectiveness of parathion or endrin in controlling the cotton leafworm was reduced to a greater extent than that of toxaphene or calcium arsenate during a 24-hour exposure of treated plants to natural climatic conditions in the absence of rainfall.

However, all of these materials exhibited good residual properties under these conditions. One-half inch of simulated rainfall applied immediately after insecticide applications was slightly more detrimental to effectiveness than rain occurring 24 hours after treatment. Rain slightly reduced the toxicity of toxaphene and parathion, appreciably reduced the toxicity of endrin, and greatly reduced the toxicity of calcium arsenate."

W. Z. Coker

Paulini, E. & Reis, S. R. **A Colorimetric Method for Estimation of DDT and BHC.** *Bull. World Health Organization.* Geneva. 1957, v. 16, No. 1, 208–11.

Knipe, F. W. **Nozzle Tip Erosion Resistance Tests.** *Bull. World Health Organization.* Geneva. 1957, v. 16, No. 1, 211–17, 1 fig.

Soap. New York. 1957 (Blue Book), 225–6, 269–70. **The Peet-Grady Method. Official Method of the Chemical Specialties Manufacturers Association for evaluating Liquid Household Insecticides, Latest Revision.**

Soap. New York. 1957 (Blue Book), 223–4. **Cockroach Spray Test Method. Official Method of the Chemical Specialties Manufacturers Association for evaluating Cockroach Sprays.**

Soap. New York. 1957 (Blue Book), 227–8, 271, 1 fig. [11 refs.] **Cockroach Aerosol Test Method. Tentative Method of the Chemical Specialties Manufacturers Association for evaluating Aerosol Cockroach Insecticides.**

Soap. New York. 1957 (Blue Book), 229–30. **Aerosol Insecticides Storage Test. Tentative Official Method of the Chemical Specialties Manufacturers Association for Storage of Aerosol Insecticides.**

Soap. New York. 1957 (Blue Book), 231–2, 270–71. [10 refs.] **Aerosol Test Method for Flying Insects. Official Method of the Chemical Specialties Manufacturers Association for assaying Aerosols for Flying Insects.**

Soap. New York. 1957 (Blue Book), 233–5, 2 figs. **Tentative Method for determination of Particle Size Distribution of Space Insecticide Aerosols.**

Nettel Flores, R. Notas sobre la distribución zoogeográfica de los primates de México. [**Notes on the Zoogeographical Distribution of the Primates of Mexico**] *Bol. Epidemiológico.* Mexico. 1955, Oct.–Nov.–Dec., v. 19, No. 4, 120–23, 2 figs. & 1 map. [13 refs.]

Setzer, H. W. **The Hedgehogs and Shrews (Insectivora) of Egypt.** *J. Egyptian Pub. Health Ass.* 1957, v. 32, No. 1, 1–17. [10 refs.]

LABORATORY PROCEDURES

Cole, E. R. & Sewell, A. K. **A Simplified Direct Preparation of Field's Stain.** *Med. J. Australia.* 1956, Oct. 20, v. 2, No. 16, 603–4.

A simple modification of the preparation of Field's stain (solution A) is described for the use of mobile units. 5 gm. methylene blue (86%), 1 gm. potassium dichromate, and 20 gm. powdered potassium acid sulphate are dissolved in 300 cc. of distilled water in a litre flask and the solution is boiled gently for 20 minutes, the water lost by evaporation being replaced. The solution is cooled slightly and 30 gm. disodium hydrogen phosphate are added; the volume is finally made up to 500 cc. Before use 1 part of the stain is mixed with 3 parts of distilled water, and excellent staining is obtained. *P. C. C. Garnham*

REPORTS AND SURVEYS

East Africa High Commission. **East African Medical Survey and Research Institute, Mwanza, Report 1955–56** [Holmes, E. G., Director]. 33 pp. 1956. Nairobi: Govt. Printer.

The functions of the Institute have changed since the publication of its last annual report [this *Bulletin*, 1956, v. 53, 1191]; they now include research into physiological, biochemical and nutritional problems and the

provision of laboratory facilities for other aspects of medical research, survey being relegated to a minor position. The present report gives a full account of nutritional work in progress to indicate the direction it will follow.

A complete diet survey of 44 families in the Taveta-Pare area of Tanganyika was undertaken. Their requirements were estimated from standard formulae, and their actual intake was recorded, analysed and compared with the standard. Special enquiries into actual energy expenditure showed that it might be far higher than that contemplated in the formulae, being raised particularly by the long journeys made by women between their farms and homes, and it is considered that such energy accounting should be routinely undertaken in diet surveys. The diets of a number of Mohammedan families were also analysed during and after the annual fast of Ramadhan.

The metabolic unit undertook studies of absorption of foodstuffs, analysing the proportion of ingested calories and nitrogen actually absorbed by patients, school boys and prisoners. In all cases values were lower than those accepted in Europe but particularly so for the prisoners, who absorbed only 81·4% of calories and 57·1% of nitrogen, with the result that an apparently sufficient diet was in fact inadequate for their needs.

Other work by this unit includes analysis of tissue composition in malnutrition, it being thought that perhaps minor degrees may result in intracellular tissue hydration.

A series of records of the height and weight by ages of schoolchildren indicate no substantial difference from English standards.

Work on filariasis by Jordan continued with a mass treatment trial, clinical investigations and entomological enquiries, which among other things showed ready infection of mosquitoes from persons in whom microfilariae were very few. Studies of the ecology of snails concerned in the transmission of schistosomiasis were started by McClelland. Moore records some findings in a study of the white blood cells of Africans, proportions between the types of which show some difference from those common in Europeans. Walton continues work on ticks connected with relapsing fever. Thomson will undertake work on serum protein levels of children in relation to malarial infection, and the routine pathology continues.

G. Macdonald

Van Der Kuyp, E. **Public Health Conditions in Surinam about 1950–1953.** *Arch. Inst. Pasteur de la Guyane Française et de l'Inini. Publication No. 402.* 1956, Aug., 6 pp.

Surinam, formerly Dutch Guiana, became self-governing in 1949. In 1953 the population was some 240,000, of whom 37% were Creoles, 30%,

Hindustani, 17·2% Indonesians and the remainder "Bush Negroes", Amerindians, Chinese, Europeans and others. The interior is almost uninhabited except by Amerindians and "Bush Negroes". Most of the population live on the coast and one-third live in the capital, Paramaribo.

There are 100 doctors (63 in Government service) and 27 medical districts in which there are 14 general hospitals, 3 leprosaria, a home for old people, a mental hospital (and another under construction), a tuberculosis hospital, and an institute for deaf-mute children. The Bureau of Public Health has a staff of 250 persons and 30 sections.

In 1951 the death-rate was 9·7 per 1,000 persons, the birth rate 37·8 and the infant mortality 45·4 per 1,000 live births.

There is a medical school and a number of training schools for medical auxiliaries.

Housing in general is bad, but is being improved by slum-clearance, by the erection of concrete instead of wooden buildings and through an "aided self-help building project". The water supply in the capital is excellent, but is inadequate in rural areas other than in the bauxite plants and some estates. Nutrition is improving. Some 2,300 schoolchildren receive a free daily lunch. A dietary survey has been started and results are promised.

Jungle yellow fever occurs, as shown by mouse protection tests. Malaria, which had an annual incidence of 5,200 in 1939, dropped to 1,843 new cases in 1950 and rapidly fell to 769 in 1953. This is attributed to the usual socio-economic improvements and to prophylactic measures.

A filariasis control service was started in 1949. 63·7% of the people have been examined and of these 5·3% had elephantiasis and 17·4% had microfilariae of *W. bancrofti* in the blood. Over 80% of the infected persons were treated with diethylcarbamazine and only 20% still had microfilaraemia after treatment.

In 1949 residual house spraying with 5% DDT began and in several areas *Aëdes aegypti* has been eradicated. Before spraying, 42·1% of yards in the capital were infested with *A. aegypti*. This percentage fell to 5% in the rainy season and as low as 0·4% in the dry. It has, however, risen again to 12·2% and it is thought that this is probably due to the development of resistance to DDT. *H. J. O'D. Burke-Gaffney*

Passager, P. & Barbançon, S. Taghit (Sahara oranais). Étude historique, géographique et médicale. [**Historical, Geographical and Medical Study of Taghit, Algeria**] *Arch. Inst. Pasteur d'Algérie* 1956, Sept., v. 34, No. 3, 404–75, 5 text figs. & 33 figs. on 16 pls. [31 refs.]

This summary details only the medical section of a very interesting general account of the history, geography and people of the small oasis of Taghit and its four satellite oases, which lie 100 km. south of

Colomb-Bechar and slightly to the east of the main trans-Sahara track. The inhabited region is the valley of the *wady* Zousfana, which winds its way between the rocky massifs and sand dunes of the Sahara. The climate is typical of the Sahara. Extreme atmospheric dryness, maximum temperatures of over 120°F. (over 130°F. in the surrounding desert), great swings of temperature between day and night, and actual frosts in the winter. are the main features. Rain occurs as irregular storms in spring and autumn. The cultivation of date palms is the main local industry. At the 1954 census the total population was 2,070. Diet reflects the extreme poverty prevailing; the normal menu is a soup of barley flour. perhaps with beans, and a handful of dates. Meat is rare; locusts are regarded as a delicacy.

The Taghit district has a resident civil medical officer, responsible also for the district's public health including prophylaxis of typhus and smallpox. and campaigns against endemic diseases. General hygienic conditions, both environmental and personal, are extremely bad and conducive to disease.

Plasmodium vivax, *P. malariae* and *P. falciparum* all are found. At present only a single vector, *Anopheles multicolor* has been found, but the presence of *A. hispaniola* and *A. sergenti* is suspected. The infant spleen rate, reduced to 3% in 1938, rose during the war to 16% in 1943, but after the posting of a resident medical officer soon fell again to 2·5%. General antilarval methods, residual spraying, and mass prophylaxis of infants with nivaquine, are in use.

Typhus and louse-borne relapsing fever have been epidemic from time to time. Leishmaniasis has been found, but is believed not to be endemic. Measles and whooping cough are important causes of infant deaths, typhoid and bacillary dysenteries are common, but amoebic dysentery has never been reported; nor, surprisingly, has cerebrospinal meningitis. In 1952 Mantoux tests gave 40·2% positives out of 1,635 persons examined over 1 year of age, a lower figure than is generally obtained from Sahara indigenes. Overt tuberculosis is mostly but not entirely pulmonary, and reaches medical aid only at a late stage. BCG vaccination has been carried out on two occasions.

As in all oases, eye diseases are the most prominent, and are the reason for over half of out-patient attendances. Trachoma is pandemic, though its complications are being reduced by modern therapeutic methods; gantrisin and aureomycin ointment (but also the classical methods) are used with good effect. Koch-Weeks and Morax-Axenfeld conjunctival infections are common, especially during spring and autumn, when flies swarm and dust storms occur. Skin diseases are common, but venereal diseases not particularly so. Bejel is not mentioned. Of helminthic infections, ascariasis is almost universal, and enterobiasis is common among children.

The paper concludes with a detailed description of local traditional medicine.

B. B. Waddy

Bouchat, J. Beni Ounif (Sud oranais). Étude géographique, historique et médicale. [**A Geographical, Historical and Medical Study of Beni Ounif, South Oran**] *Arch. Inst. Pasteur d'Algérie.* 1956, Dec., v. 34, No. 4, 575–671, 8 text figs. & 34 figs. on 16 pls. [185 refs.]

Beni Ounif, a Saharan oasis on the Moroccan border of Algeria, virtually rainless and watered by underground flow from the Atlas mountains to the north, has been inhabited by man from the Stone Age, as shown by rock drawings. It now supports 3,384 people of varied negroid and Arab descent who, as settled and nomadic groups, constitute the true desert population. Its nucleus is a date-palm grove around which there are some other fruit groves, poor corn fields and much uncertain pasture. In 1908 Dr. Foley founded the advance laboratory of the Pasteur Institute in Algeria in this oasis; he has operated it up till the time of this report and is the author or joint author of many of the 185 publications listed which concern the area. He has been joined by other members of the Pasteur Institute and visitors, including many with distinguished names. Prominent among them are the Sergents—Edmond and Etienne, Parrot and Leblanc. His and their work over 50 years has constituted a unique epidemiological, ecological, parasitological and hygienic study which is here brought together.

A full description of the area and of its people with their mode of life, customs and beliefs is followed by a summary of the medical studies. Malaria and tuberculosis are the two most important diseases; relapsing fever, typhus, smallpox and ophthalmia come constantly to attention, but by comparison with other countries pneumococcal, meningococcal and dysenteric infections, and nutritional diseases, are rare. The epidemiological studies of malaria are noteworthy for their continuity and detail and, though small in scale, have been remarkable for clarity. The disease was eradicated in 1927 but reintroduced in 1946. There have been studies of cutaneous leishmaniasis and its vectors, of relapsing fever—the transmission of which by lice was demonstrated here—of typhus and its transmission, of helminthic infections including the demonstration of a true indigenous case of infection with microfilariae of *Dipetalonema perstans* far outside its normal range, ophthalmias, trachoma and many bacterial diseases. Brucellosis was introduced about 1942; syphilis was common and often accompanied by juxta-articular nodules but has now been brought under control. Tuberculosis of the bones, joints and lungs was very prevalent and some of the early trials of tests of allergy by the methods of Von Pirquet and Mantoux were carried out here (in 1911 and 1929, respectively); BCG vaccination was introduced in 1929 and a technique of application by scarification without previous test of sensitivity was established as simple, harmless and effective, eliminating tuberculosis from Beni Ounif and establishing a method widely adopted.

There are further notes on mycoses, ectoparasites, non-infectious

diseases, surgical pathology and the practice of indigenous medicine with details of the drugs in use, and on some veterinary conditions.

[Beni Ounif has truly been the site of studies unique in such places for their continuity, diversity and value. Dr. Foley, his co-workers and the Pasteur Institute are fortunate in their historian who produces an exceptional account of an ecological study.] *G. Macdonald*

BOOK REVIEWS

G. E. N. Caracas. 1955, July–Dec., v. 10, Special No., 618 pp., numerous figs. [Numerous refs.] **Schistosomiasis mansoni.** [Schistosomiasis due to *S. mansoni*] Segundas Jornadas Venezolanas de gastroenterología, endocrinología y nutrición, 14, 15, 16 de julio de 1955, organizadas por la " Sociedad Venezolana de Gastroenterología, Endocrinología y Nutrición " [Candia Candia, E., President].

This large volume of more than 600 pages contains a detailed account of the proceedings of a conference on *Schistosoma mansoni* infection organized by the Venezuelan Society of Gastroenterology, Endocrinology and Nutrition in July 1955.

In addition to a number of addresses by distinguished persons, there were 25 scientific papers, to which 30 workers contributed. Several of these workers and their studies, already published, will be familiar to readers of this *Bulletin*. Many of the papers are very full, and are lavishly illustrated with maps, tables, charts, skiagrams, photographs and diagrams.

It is unfortunately not feasible to abstract this large collection of lengthy papers and the reviewer can do no more than indicate their nature and scope.

After a profusely documented history of schistosomiasis in Venezuela by J. Iturbe, there follow two papers on schistosomiasis in that country from the sanitary aspect, respectively by D. Curiel with P. Guzman and Elena de Ochoa; and by two public health engineers, J. A. Jove and P. Marszewski. The first gives a detailed account and figures of mortality and incidence and the second elaborates this aspect with epidemiological data for different regions, with special reference to control measures. F. Pifano presents a comprehensive account of the biology of experimental *S. mansoni* infection. The early manifestations of the disease are discussed by J. M. Ruiz Rodriguez and this is followed by papers on the hepato-intestinal form and on the hepatic-splenic form by J. R. Zerpa Morales and H. B. Pinto, respectively. Endoscopic, radiological and haematological findings each forms the substance of a paper:

the first by E. Candia and C. E. Louis; the second by F. Lechin and the third by O. Lima Gomez. A paper on the cardiovascular aspects is presented by C. Gil Yepez and A. Sanabria and on coprological examination by J. Barnola. Intradermal tests are discussed by F. Pifano and M. Ron Pedrique and compared with other tests: the same authors give data on the complement-fixation test and the cercaria reaction. A critical evaluation of all the diagnostic measures is made by J. V. Parparcen. A short paper by R. Jaffe on liver lesions, is followed by two by J. A. O'Daly, dealing, respectively, with enteric lesions and with lesions of the spleen. Pathological changes in the colon and rectum are reviewed by B. Bruni Celli and L. Potenza gives a short account of aberrant localizations of the eggs of the worm. Drug treatment is covered by M. R. Pedrique and E. Gerulewics and surgical treatment of eosophageal varices by E. Carbonell, while F. R. Coronil gives an account of splenectomy in the treatment of the "Banti syndrome" in schistosomiasis. Venous anastomosis in the portal hypertension associated with the hepato-splenic syndrome in schistosomiasis is the subject of a paper by R. B. Gonzalez. The series ends with a paper on "bilharziomas" of the colon by M. P. Carreño and Augusto Diez.

The papers are all written in Spanish, but a few of them are accompanied by summaries in English.

This highly comprehensive series of papers covers a wide field of knowledge of the subject of South American schistosomiasis, and should prove to be a very useful monograph for those who read Spanish and, indeed, because of its clear presentation, is in several respects also informative for those who do not. *H. J. O'D. Burke-Gaffney*

Buckley, Eleanor E. & Porges, Nandor [Edited by]. **Venoms. Papers presented at the First International Conference on Venoms December 27–30, 1954, at the Annual Meeting of the American Association for the Advancement of Science, Berkeley, California.** pp. xii + 467, numerous figs. 1956. Washington 5: Amer. Ass. for the Advancement of Sci., 1515, Massachusetts Avenue, N.W., U.S.A. London: Bailey Bros. & Swinfen, Ltd., 46, St. Giles High Street, W.C.2. [$9.50; 86s.]

This book contains contributions made to the First International Conference on Venoms, held in 1954 at Berkeley, California, by the American Association for the Advancement of Science. The list of authors is representative of those most active in the field of venoms today, from Formosa to the United States, but excluding the U.S.S.R. and associated countries. The book is informative and well arranged. It should be widely read. Subjects discussed include various aspects of poisonous fishes, lizards, toads, spiders, insects, scorpions and snakes. As might be expected most of the interest is concentrated on the scorpions and snakes. There is a good index to the 60 odd papers presented.

Almost every paper in the collection deserves review in its own right. Any attempt at objective reviewing of the whole is therefore quite impossible and it is left to the reviewer to refer to a few articles which he finds of special interest: current research on Pacific poisonous fishes (B. W. Halstead); enzymatic activity of spider venoms (E. Kaiser); various articles on scorpion venoms and the treatment of scorpion sting; pharmacological and physiological properties of various snake venoms, including those of Australian snakes; general accounts of the significance and extent of snake poisoning as a world problem (S. Swaroop and B. Grab) and, specifically in Central America (M. S. Ambrose), in the Sudan (N. L. Corkill), in India (M. L. Ahuja and Gurkirpal Singh), in Siam (Chaloem Purananda); an interesting description of the Australian Taipan; and a collection of articles on the production and standardization of antivenenes. There is also a useful list of the antivenenes available for treatment of envenomation by snakes, scorpions and spiders (H. L. Keegan). *B. G. Maegraith*

Hoogstraal, Harry. **African Ixodoidea. Vol. I. Ticks of the Sudan (with special reference to Equatoria Province and with Preliminary Reviews of the Genera** *Boophilus*, *Margaropus*, **and** *Hyalomma*). 1101 pp., 372 figs. on 103 pls. 1956. Wash. 25: U.S. Govt. Printing Office, D.C., U.S.A.

This is the first volume of several to be prepared on ticks of Africa and their relationships to disease in man and animals. Collecting expeditions and observations in the Nile Valley and the Sudan and studies of tick collections in numerous institutions are the foundations of this volume. The text is not limited to information relevant only to the Sudan and the Nile Valley. A tick species, if recorded from the Sudan but also important medically or economically elsewhere in Africa, is dealt with in the broader context. Distribution in African territories is recorded and its biology and importance are discussed on the basis of facts available from any part of its range. Moreover, very full consideration is given to laboratory researches on biology or disease transmission. Thus, for example, *Ornithodoros* [*Ornithodorus*] *moubata* is well treated in about 70 pages under such headings as distribution in the Sudan and elsewhere, hosts (wild and domestic), ecology, biology, structure and function of organs, relationship to disease, and control. Like treatment is given to other argasids and ixodid tick species. Keys are provided for the following numbers (in brackets) of species and subspecies of different genera in the Sudan: *Argas* (6), *Ornithodorus* (2), *Amblyomma* (8), *Aponomma* (2), *Boophilus* (2), *Dermacentor* (2), *Haemaphysalis* (7), *Hyalomma* (8 Sudan species and 5 other species from elsewhere in this difficult genus), *Ixodes* (6), *Margaropus* (male, female, and nymph of a new species, *M. reidi*, from giraffe are described and figured), and *Rhipicephalus* (20). There

are chapters on climatic and biotic features, and on sources and hosts of tick in the various provinces of the Sudan.

There is every reason to recommend this volume as an important reference book for those concerned with the study of ticks and their significance in the fields of medical or veterinary science, not only in the Sudan but the whole African continent. It is valuable as a compendium of literature (there are about 2,000 references in the bibliography) besides containing original findings and conceptions by the author on difficult problems in tick systematics and other aspects of these ectoparasites. A considerable appendix is in the form of abstracts from papers seen or published after the main text was compiled: it is intended that this be continued in the volumes to come. There seems room to regret that so much work and information should be reproduced in typescript bound only in cardboard covers. *D. S. Bertram*

Taylor, W. Norman [M.D., D.P.H., D.I.H., F.R.S.H.]. **A Textbook of Hygiene for Teachers in Africa.** 296 pp., numerous illustrations. 1956. New York. Toronto. London: Longmans, Green & Co. Ltd., 6 & 7, Clifford Street, W.1. [10s. 6d.]

This book is intended for teachers primarily of African children. Its object is to set out human anatomy, physiology and biology, and school hygiene in straightforward language, to increase the ordinary teacher's understanding and ability to answer children's questions. It includes chapters on mental health and sex; the latter is frank, full and well illustrated, entirely without prurience or embarrassing phrases. The writing throughout is clear and simple without condescension.

The question to be answered in a review of such a book is: does it attain its objects satisfactorily ? In the opinion of the reviewer, backed up by one or two experienced colleagues, this book succeeds completely, and therefore fills what has been a serious want. It is recommended to the notice of education authorities in tropical countries (its African origin is indicated only by its title and photographs) as a book which will benefit every elementary school teacher.

For future editions, " tropical countries " might be substituted for " Africa " in the title, with very little alteration of the book. The index, though clear, might be made fuller. The price should be reduced a little if possible, perhaps by omitting the photographs. *B. B. Waddy*

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